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OFFICE OF THE

Auditor General of British Columbia

Infection Control: Essential for a Healthy British Columbia:

The Provincial Overview

March 2007

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The Honourable Bill Barisoff
Speaker of the Legislative Assembly
Province of British Columbia
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Dear Sir:

I have the honour to transmit herewith to the Legislative Assembly of British Columbia my 2006/07 Report 11: Infection Control: Essential for a Healthy British Columbia. This report consists of seven volumes: The Provincial Overview and a separate report for each Health Authority.

Arn Van Iersel, CGA
Auditor General (Acting)

Victoria, British Columbia
March 2007

copy: Mr. E. George MacMinn, Q.C.
Clerk of the Legislative Assembly

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Auditor General's Comments

Arn van Iersel, CGA
Auditor General (Acting)

The health care environment deals with sick people who have compromised immune systems, those with chronic illnesses and people who are suffering from some acute ailment but are generally healthy overall. This mix of patients with their multiple diagnoses creates an environment of some inherent risk of picking up an infection. However, good infection prevention, surveillance and control can reduce this risk. Yet, according to researchers, an average of one in nine hospital patients in Canada gets an infection that may force a longer stay, greater pain, or even death.

Outside hospitals, anywhere in the community, there can be people whose undiagnosed illness starts spreading to others before being detected. In extreme cases, such a spread raises the spectre of a possible "super bug" pandemic. The 2003 outbreak of SARS (Severe Acute Respiratory Syndrome) in Ontario, showed the enormous impact that such events can have on individuals, their families, and the health system. That outbreak resulted in 375 probable and suspected cases and 44 deaths.

In health facilities in Quebec, clostridium difficile (C. difficile) associated disease is estimated to have killed 2,000 elderly patients between 2003 and 2004.

Both of these situations sent clear signals to governments and health care service providers across Canada that infection prevention, surveillance and control must be major components of a responsible and effective health care system.

Lack of good surveillance data in British Columbia makes it difficult to know the full extent or overall cost of hospital-related infections. However, consider just one organism —methicillin-resistant staphylococcus aureus (MRSA), which is classified as antibiotic-resistant. In 2004, the B.C. Association of Medical Microbiologists' surveillance program identified 5,063 new MRSA patients[1]. Using cost data from the Vancouver Coastal Health Authority, we can estimate that these MRSA patients alone, when treated in hospital would have cost the province's health care system in 2004 over $30 million. And that does not include the cost of any associated longer term impacts that MRSA may have had on the individuals contracting it or on their families.

[1] The patient numbers are those identified at each participating laboratory, each patient counted only once at each site. However, patients may be counted more than once if they submitted cultures to more than one of the participating laboratories.

Auditor General's Comments

A new mother sits by her tiny, premature baby in a neonatal intensive care unit. She watches as a physician touches the baby without first washing his hands or using the waterless, alcohol-based hand antiseptic just a couple of feet away. A few minutes later, a nurse and then another doctor also fail to perform these basic procedures. When her baby was admitted to the unit, the mother was told to remind caregivers to wash their hands, but only after witnessing repeated failures does she muster the courage to speak up about the practice she thought would be routine. By then, her baby has acquired methicillin-resistant staphylococcus aureus—probably transported on the hands of a caregiver who had been examining other babies who are colonized with MRSA. A few days later, MRSA invades the baby's bloodstream; it eventually proves fatal.

Source: Dr. Donald Goldmann. 2006. "System Failure versus Personal Accountability – The Case for Clean Hands." *New England Journal of Medicine*, July 13, 2006. See Appendix A for the full article. (Used with permission.)

I undertook this audit to assess whether all the health authorities in British Columbia have effective systems in place for preventing, controlling and tracking infections across all service delivery responsibilities. My focus was on the five geographically defined health authorities and the Provincial Health Services Authority. I also looked at the Ministry of Health to see if it provided a framework for the health authorities.

Specifically, the audit team examined whether the Ministry of Health and the Provincial Health Services Authority provide a framework for infection prevention, surveillance and control; and whether each of the health authorities:

- has a workable plan in place for prevention, surveillance and control of infections;
- is demonstrating best practices for infection prevention, surveillance and control;
- has information system support in place for infection prevention, surveillance and control; and
- is reporting on the status of its infection prevention, surveillance and control efforts and is making continuous improvements.

We found the Ministry of Health's role to be incomplete. The ministry has not provided a comprehensive framework for infection prevention, surveillance and control across the continuum of care (residential care, acute care, mental health, public health and home and community care). However, through legislation the ministry has provided Public Health a framework for communicable disease control which could form the basis on which to build infection prevention, surveillance and control across the province.

Our findings within the health authorities are of significant concern.

Overall we concluded that the health authorities do not yet have effective or integrated systems in place for the prevention, surveillance and control of infections. Two of the health authorities have responded to the increasing threat of infection spread with some urgency, by identifying areas of concern within their infection control program and taking steps to address them. Others however, have taken few concrete steps and need to establish a sense of urgency in addressing issues. Most of the health authorities, we

found, have carried out very limited integrated planning for infection prevention, surveillance and control across the continuum of care (residential care, acute care, mental health, public health and home and community care). The resources they have dedicated for infection prevention, surveillance and control of infections have not kept pace with changing organisms or the need to ensure best practice. And, the inadequacy of information system support across the province—meaning there is no comprehensive surveillance and reporting of infections—limits what actions the health authorities can take.

At St. Paul's Hospital in Vancouver, the camera showed doctors visited a patient with pneumonia and the super bug MRSA. Despite a warning posted on the door, the doctor's touched the patient's table and left without washing their hands.

The doctors then went to the room of another highly contagious patient. Again, they did not wash their hands although hand gel sanitizers and sinks were readily available.

"If I saw this in my hospital, I would have a fit," infection control expert Dr. Michael Gardham of Toronto's University Health Network said of the footage.

"Physicians are always the worst offenders," Gardham added. "They're the least likely to wash their hands," a simple act that could prevent the majority of infections.

St. Paul's Hospital is trying to encourage hand washing, but it is difficult to make the message hit home, said Dr. Jeremy Etherington, the hospital's vice-president. "I can promise you will see more [hand washing] as we continue our campaigns," Etherington said.

Source: Camera captures lack of hygiene in hospitals. CBC News, Marketplace. Feb 7, 2007. (Used with permission.)

Infection Control Practitioners and medical staff with responsibilities in the area of infection prevention and control (medical microbiologists/pathologists, Medical Health Officers, infectious disease specialists and chairs of Infection Control Committees) have struggled with limited resources and the support needed to ensure a safe environment.

I believe that leadership must be shown by the Ministry of Health, health authority Boards of Directors, senior executives and Medical Advisory Committees to ensure adequate resources for infection prevention, surveillance and control programs in British Columbia. Only in this way can the province's health care system create as safe an environment as possible for patients and their families.

Auditor General's Comments

Our key findings are summarized below. A detailed report on each health authority is provided on our website http://www.bcauditor.com.

A provincial framework for infection prevention, surveillance and control is limited to Public Health

The Ministry of Health has a framework in place for communicable disease control, but not for hospital-acquired infections. The framework for communicable disease control is contained within the Health Act, which outlines roles and responsibilities as well as reporting requirements. The ministry established the Provincial Infection Control Network (PICNet) in conjunction with the health authorities to work towards the establishment of a province-wide approach and framework for infection prevention, surveillance and control.

We recommend that the Ministry of Health:

- **Establish and implement a provincial framework for infection prevention, surveillance and control which at a minimum contains: comprehensive legislation, defined roles and responsibilities, surveillance, standards and reporting.**
- **Establish provincial surveillance for hospital-acquired infections and work with key stakeholders to determine what should be reported.**

There is little or no integrated planning for infection prevention, surveillance and control across the continuum of care in the health authorities

Planning for infection prevention, surveillance and control by the health authorities needs to be strengthened. None of the health authorities has an integrated plan for infection prevention and control across the continuum of care (residential care, acute care, mental health, public health, and home and community care). Although some have included aspects of infection control in their strategic and health service plans, there is not an integrated focus across all services.

We recommend that each health authority:

- **Develop an integrated plan for infection prevention, surveillance and control across the continuum of care.**
- **Assess their current Public Health and infection control structure to ensure integrated planning and service delivery for infection prevention, surveillance and control.**

Demonstrating best practices in infection prevention, surveillance and control needs to be strengthened

All of the health authorities are aware that they are not demonstrating best practices in every aspect of infection prevention, surveillance and control; and the majority are taking steps to remedy the situation. However, recognition of the need to change, and the urgency with which changes are being made varies from one health authority to another.

We recommend that each health authority:

- **Work with the Ministry of Health and the B.C. Centre for Disease Control to establish a basic template for a provincial manual for infection control in acute and residential care.**
- **Undertake a formal review to estimate their overall requirements for both Infection Control Practitioners and Communicable Disease Nurses, giving consideration to: ratios; the complexity of care provided; needs of other programs such as home and community care, residential care and mental health; and to the educational needs of staff. They should also ensure adequate medical and clerical support for the program.**
- **Review their infection control structures to ensure there is appropriate and designated medical support in place for the program.**
- **Ensure that renovations and new construction designs mitigate the risks of spreading infections.**
- **Ensure that all staff receive regular ongoing education in the area of infection control and that medical staff also have access.**

- **Ensure that the infection control team has adequate resources to maintain current practice standards through ongoing education.**
- **Establish a formal surveillance program appropriate to the programs and services offered.**
- **Establish a process for regular formal and informal monitoring of practice.**

An integrated information system for infection prevention, surveillance and control is in place only for Public Health

The health authorities have information management plans in place, but no modules offer direct support for the infection control program. As well, while the authorities acknowledge the need to provide information management support to their infection control programs, at the time of our audit only the Vancouver Coastal Health Authority and Interior Health Authority were actively pursuing software programs to support their infection control programs.

Because each health authority—and even programs and sites within a health authority—may collect its own information on infections using various technologies, case definitions, and tracking and input methodologies, data quality may be negatively affected.

Public Health in each health authority has an information system with standardized data definitions in place that links provincially—the Integrated Public Health Information System (iPHIS), hosted by the Provincial Health Services Authority and the British Columbia Centre for Disease Control. Only Vancouver Community and Richmond Public Health (within the Vancouver Coastal Health Authority) do not use iPHIS. However, its system, the Primary Access Regional Information System, links with iPHIS.

We recommend that the health authorities:

- **Provide information management support to the infection control program for data collection, analysis and reporting.**
- **Ensure there is staff with appropriate training to support data quality.**
- **Work with the Ministry of Health and other stakeholders to ensure data quality.**

Reporting on prevention, surveillance and control of infections varies by the health authority and, overall, is not well done

Reporting on infection control to the Health Authority Medical Advisory Committees, senior executive teams and Boards of Directors varies across the health authorities. In general, however, the reporting that is done is usually ad hoc and does not provide a comprehensive picture of infection control in the authorities.

The Vancouver Coastal Health Authority issues a comprehensive annual report on its infection control program, which it makes available on its website. The Vancouver Island Health Authority also issues an annual report, but that report is not made available to the public. As well, the British Columbia Centre for Disease Control issues an annual summary of reportable diseases in the province, which is available on their website.

We recommend that each Board of Directors:

- **Work with their senior management to determine what infection control indicators they need measured and reported on.**
- **Hold the Medical Advisory Committees accountable for fulfilling their mandates.**

We recommend that the health authorities:

- **Ensure that infection control surveillance and audit reports are available and used by all programs to improve practice across the health authority as appropriate.**
- **Have their senior management teams identify infection control reports and information that they need to receive on a regular basis.**
- **Ensure that the infection control program issues a comprehensive annual report that includes rates and types of infections. This report should be available to the public.**

Auditor General's Comments

While there is much to do, I am encouraged that the Ministry of Health and the health authorities recognize the seriousness of the issue and are taking steps to address it.

Arn van Iersel, CGA
Auditor General (Acting)

Victoria, British Columbia
January 2007

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Detailed Report

Background

Infection prevention, surveillance and control programs aim mainly at protecting patients, health care workers and visitors from contracting an illness while in the health care environment. Public Health programs have a similar goal: that of preventing the spread of communicable diseases in the population at large. Data on communicable diseases is available but data on the impact of hospital-acquired infections in British Columbia is very limited, although some health authorities have made attempts to examine the costs of specific organisms. However, studies highlight the enormity of the issue of hospital-acquired (nosocomial) infections (see below).

The Numbers on Health Care Acquired Infection

In New Zealand in 2003, it was estimated that about 10% of patients admitted to hospital will acquire an infection as a result of their hospital stay. A study released by the British National Health Service in the same year found that 9% of the population acquired an infection during a hospital stay and estimated that the cost per patient increased three-fold when the individual contracted a hospital-associated infection.

In the United States, it is estimated that nearly 2 million patients a year get an infection in a health care facility and, of those, about 90,000 die as a result of the infection. More than 70% of the bacteria that cause hospital-acquired infections are resistant to at least one of the drugs most commonly used to treat them. It is estimated that treating hospital-acquired infections accounts for 2% of total hospital costs.

A Canadian survey (reported in 2000) of hospitals with greater than 80 beds found that only 13% of hospitals adequately monitor hospital infections and only 1 in 5 institutions had the staff and procedures necessary to keep infections controlled. The lead author of that report also prepared data for the Romanow Commission. That information indicated that Canadians contract more than 200,000 hospital-acquired infections annually, resulting in 8,500 – 12,000 deaths per year. The direct costs of hospital-acquired infections were estimated to be around $1 billion annually.

While infection prevention, surveillance and control programs have been part of British Columbia health care facilities for a long time, the capacity of such programs has always varied from one facility to another. These differences in capacity and resources were carried into the 2001 reorganization of the British Columbia health care system. At that time, the system was organized into the Provincial Health Services Authority and five geographically defined health authorities: Interior Health, Fraser Health, Northern Health, Vancouver Coastal Health and Vancouver Island Health. Each of the latter five is responsible and accountable for care delivery across the continuum of care (residential care, acute care, mental health, public health and home and community care).

The Provincial Health Services Authority is responsible for specialized provincial health services, such as cardiac surgery, which is delivered in a number of locations within the regional health authorities. As well, the provincial authority operates the following provincial agencies:

- British Columbia Centre for Disease Control
- British Columbia Cancer Agency
- British Columbia Provincial Renal Agency
- British Columbia Transplant Society
- British Columbia Children's Hospital and Sunny Hill Health Centre for Children
- British Columbia Women's Hospital and Health Centre
- Riverview Hospital
- Forensic Psychiatric Services Commission

In the first few years of this realignment, infection control in the health authorities operated as separate programs within facilities or a cluster of facilities, much as they had done before. At the same time, Public Health continued to operate within the Health Act and its regulations for communicable disease control. Not surprisingly, both these factors make it difficult to bring an integrated approach to infection control management across the continuum of care.

Background

Interior
Fraser
Vancouver Coastal
Vancouver Island
Northern
Northwest
Northeast
Northern Interior
Prince George
North Shore/
Coast Garibaldi
Thompson
Cariboo
Shuswap
Kamloops
North Vancouver Island
Campbell
River
East
Kootenay
Kelowna
Cranbrook
Fraser
Okanagan
Kootenay
Boundary
Central Vancouver Island
Nanaimo
South
Vancouver Island
Victoria
North
Shore/
Coast
Garibaldi
Fraser
North
Vancouver
Richmond
Fraser
South
Fraser
East
Surrey
Abbotsford

Background

Terminology Used in the Report

Infectious diseases are classified in many ways e.g. by organism type, by mode of transmission, or by setting. For this audit, infectious diseases can be regarded as those that are thought to be acquired in a healthcare setting (e.g. hospital, out-patient day surgeries, diagnostic and treatment centres, long term care facilities, and as part of home care) and those that are thought to be acquired outside of healthcare in a community setting such as the home, or in a public place such as a restaurant or on a bus. Contracting an infection in a healthcare facility or the community has important implications for prevention and control measures, and has resulted in the development of Public Health and hospital-based programs.

In healthcare, patient, visitor and worker well-being comprise the main infectious disease concerns, and programs are designed primarily to protect patients and workers. Healthcare based approaches to prevention and control are often referred to as "infection prevention and control programs" (for patients) and "occupational health and safety programs" (for workers), and deal with infections contracted there (nosocomial infections).

In the community the concerns include reducing the overall burden of disease and threats to public health from outbreaks and epidemics, and programs are designed to prevent these community-wide impacts. To prevent and control these are "communicable disease prevention and control programs" that deal with communicable diseases.

The organisms that cause these diseases travel back and forth between healthcare and community settings. Sometimes a community outbreak will affect a healthcare setting (influenza outbreak in a care facility) and sometimes a setting can be both a healthcare and community setting. (i.e. residential care for people with mental illness). Consequently, it is critical that infection control, occupational health, and communicable disease control programs operated by Public Health work closely together.

Audit Purpose and Scope

The purpose of our audit was to assess whether the health authorities have effective systems for the prevention, surveillance and control of infections across all service delivery responsibilities.

We focused on the Ministry of Health, the Provincial Health Services Authority and the five geographically defined health authorities. Specifically, we wanted to find out whether the Ministry of Health and the Provincial Health Services Authority provide a framework for infection prevention, surveillance and control; and whether each of the health authorities:

- has a workable plan in place for prevention, surveillance and control of infections;
- is demonstrating best practices for infection prevention, surveillance and control;

- has information system support in place for infection prevention, surveillance and control; and
- is reporting on the status of its infection prevention, surveillance and control efforts and is making continuous improvements.

For the purpose of this audit, we reviewed four agencies in the Provincial Health Services Authority, but combined them into two groupings for our discussion. One is the British Columbia Children's Hospital and Sunny Hill Health Centre for Children, combined with the British Columbia Women's Hospital and Health Centre. We refer to this grouping as Children's and Women's. The other grouping is Riverview Hospital and the Forensic Psychiatric Services Commission, which we refer to here as Riverview and Forensics.

The other agencies within the Provincial Health Services Authority operate in other health authorities or they are provincial or national programs. For example, the B.C. Transplant Society has its own pre-assessment and follow-up clinics but its transplants are preformed within another health authority such as Vancouver Coastal. It sends reports to its national society (although the Provincial Health Services Authority is accountable for the results of its services).

We did not examine the infection prevention, surveillance and control practices in the B.C. Ambulance Service, physicians' offices or facilities not funded by the health authorities.

We carried out our audit fieldwork from July 2005 to February 2006.

We performed the audit in accordance with assurance standards recommended by the Canadian Institute of Chartered Accountants and accordingly included such tests and other procedures as we considered necessary to obtain sufficient evidence to support our conclusions. In gathering our evidence, we reviewed documents prepared by the health authorities, the Ministry of Health and other agencies and organizations. We also interviewed board members, senior management, managers and physicians in the health authorities, as well as staff within the Ministry of Health.

Background

Overall Conclusion

The health authorities in British Columbia do not have an effective or integrated system in place for the prevention, surveillance and control of infections. Although all of the health authorities have some components of such a system, not one of them has a comprehensive program or system in place to ensure best practices are always being followed across the continuum of care.

As the SARS outbreak in Toronto showed, there needs to be an integrated and coordinated approach to infectious disease management across the continuum of care.

Providing a framework for infection prevention, surveillance and control

The Ministry of Health is the steward of the health system and, as such, sets the system's direction and funds and monitors it to ensure the direction is being achieved. The Provincial Health Services Authority leads provincial initiatives as directed by the ministry.

The prevention, surveillance and control of infections require a provincial perspective. We therefore expected the Ministry of Health, in conjunction with the Provincial Health Services Authority to provide a framework for infection prevention, surveillance and control in the health authorities.

Conclusion

There is a provincial framework in place for communicable disease control, but not for the control of hospital-acquired infections. The Ministry of Health is currently working with the health authorities to establish a province-wide approach and framework for the prevention, surveillance and control of all infections.

Findings

Legislation is in place for the prevention, surveillance and control of communicable diseases

The Health Act is the key legislation for communicable disease control. The Act defines the roles and powers of the Provincial Health Officer and the Medical Health Officers across the province. As well, the Act and its associated regulations detail the powers of investigation, the handling of dangerous infectious or contagious diseases, and the isolation and quarantine of infected persons.

However, events in Ontario such as the contamination of drinking water in Walkerton and the SARS (Severe Acute Respiratory Syndrome) outbreak—and the resulting provincial reviews—highlighted several issues in that province's ability to handle an infectious disease outbreak. These events highlighted the need for British Columbia's Ministry of Health to continue with its project to update the Health Act to ensure it is current, that roles and responsibilities are clearly defined, and that all necessary actions can be taken in an effort to contain any outbreaks. This review was underway at the time of our fieldwork, and a draft discussion paper was out to stakeholders for comment and feedback.

Providing a framework for infection prevention, surveillance and control

Legislation is silent on the prevention, surveillance and control of hospital-acquired infections

The Hospital Act and its regulations are silent on any aspect of infection control, except for specifying that a patient with a communicable disease must not be admitted to a hospital unless there is suitable accommodation for isolation. There is no requirement for hospitals to report their nosocomial (hospital-acquired) infection rates because those rates have not generally been tied to Public Health, which follows the Health Act and its regulations. However, it was suggested "that events such as the Clostridium difficile associated disease outbreak in Quebec should call this practice into question. The fact that no one was paying attention to these rates meant it took a long time to identify the problem."

The Community Care and Assisted Living Act is also silent regarding prevention, surveillance and control of infections. However, it does require operation of facilities in a manner that will promote health and safety. In addition, the Medical Health Officer is responsible for licensing facilities under the Act as well as inspecting them on an ongoing basis to ensure a standard of care.

The Ministry of Health's 2005/06 – 2007/08 Service Plan establishes an objective related to infection prevention for Public Health

The ministry outlines three goals in its 2005/06–2007/08 Service Plan:

1. improved health and wellness for British Columbians;
2. high quality patient care; and
3. a sustainable, affordable, publicly funded health system.

Within the first goal, one objective is the protection of the public from preventable disease, illness and injury. The key strategies relevant to infection prevention and control are to:

- protect health by implementing core Public Health prevention and protection programs including immunization programs, infectious disease prevention and control measures; and

- develop coordinated system-wide approaches for responding to major public health risks, emergencies or epidemics (e.g., SARS, West Nile and Influenza), and collaborate with other provinces through participation in a new Public Health Network.

The plan does not include any objectives for infection prevention, surveillance and control in other parts of the system such as hospitals. However, goal 2 does have as one objective: patient-centred care tailored to meet the specific health needs of patients and patient sub-populations. A key strategy to attain that objective is ensuring clinical services are organized and delivered safely and at high quality. This is to be accomplished by reviewing safety issues and developing guidelines, best practices and performance measures. Patient safety may encompass infection prevention, surveillance and control.

Roles and responsibilities need to be more clearly defined

The key players in providing a framework for infection prevention, surveillance and control in British Columbia are the Ministry of Health, the Provincial Health Services Authority and the British Columbia Centre for Disease Control, an agency of the authority.

Since the formation of the health authorities in 2001 the roles and responsibilities of the partners continue to evolve, thereby causing some ongoing confusion. This confusion is particular to the leadership role of the Ministry of Health and the Provincial Health Services Authority in providing direction to the health authorities.

Ministry of Health

The ministry's role is one of stewardship: setting direction, providing a framework through legislation and regulation, monitoring system performance, and initiating action as necessary to ensure the health system continues to meet the needs of the population.

The Population Health and Wellness Division of the ministry is involved in public health issues, including communicable diseases, and works very closely with the Provincial Health Officer in the areas of standards and policy development. In March 2005, the division released a document called "A Framework for Core

Providing a framework for infection prevention, surveillance and control

Functions in Public Health." The document defined a robust Public Health program and identified what the health authorities were to pay attention to, including nosocomial infections (as part of the prevention of adverse health effects in the health care system). The health authorities were provided funds to conduct a gap analysis to determine how they meet the core programs. They were then to be provided with $8 million (for all) over each of the next three years to address some of the identified gaps. The proposed core functions are outlined in Exhibit 1.

Exhibit 1

Proposed Core Programs for Public Health for British Columbia

Proposed Core Programs for Public Health for British Columbia	
Health Improvement Programs Intended to improve overall health and well-being; they are capable of preventing a wide range of acute and chronic diseases and disability, as well as injuries.	*Reproductive Health* • healthy sexuality; preconception health; family planning; prenatal care and education; and postpartum care and support. *Healthy Development* • healthy infant and early childhood development (0-6); and healthy child and youth development. *Healthy Communities* • healthy schools, workplaces, and care facilities; community development and capacity building. *Healthy Living* (population-wide, non-specific) • non-smoking/tobacco control; healthy eating; and active living. *Mental Health Promotion* *Food Security*

Providing a framework for infection prevention, surveillance and control

Proposed Core Programs for Public Health for British Columbia	
Disease, Injury and Disability Prevention Programs Intended to prevent specific health problems that make, or might make, a significant contribution to the burden of disease.	*Chronic Disease Prevention* (high-risk populations; specific diseases) • cardiovascular disease; cancer; neurological and sensory; musculoskeletal; chronic respiratory; digestive; and diabetes. *Unintentional Injury Prevention* • falls, especially children and seniors; motor vehicle crashes; poisoning; recreational and leisure; and drowning, fires etc. *Prevention of Violence, Abuse and Neglect* • assault, including homicide; violent exploitation of women; and child and elder abuse. *Prevention of Mental Disorders and Problematic Substance Use* • depression/anxiety; psychoses; suicide and suicide attempt; and problematic substance use and addictions. *Communicable Disease Prevention and Control* • vaccine-preventable diseases; HIV/AIDS, STDs, blood borne; TB; vector-borne; new/emergent diseases. *Dental Health and Prevention of Dental Disease* *Prevention of Disability* (including appropriate early intervention) • sensory (hearing, vision, speech); and other. *Prevention of the Adverse Health Effects of the Health Care System* • nosocomial infections; medical error; unnecessary/inappropriate provision of services; and environmental impacts of health care.

Providing a framework for infection prevention, surveillance and control

Proposed Core Programs for Public Health for British Columbia	
Environmental Health Programs Intended to protect people from environmental hazards, caused by natural and human activity, in the built and natural environments.	*Water Quality* • drinking water; and recreational water. *Air Quality* • indoor; and outdoor. *Safe Food* *Community Sanitation and Environmental Health* • waste management (sewage, solid waste); vector control; public exposure to chemicals and radiation; complaint response and assessment; and land-use and environmental planning.
Health Emergency Management Programs Intended to coordinate available resources to deal with emergencies effectively, thereby saving lives and avoiding injury.	*Prevention and Mitigation* *Preparedness* *Response and Recovery*

Source: B.C. Ministry of Health, Population Health and Wellness Division, "A Framework for Core Functions in Public Health" (March 2005)

The ministry has a direct role through the Provincial Health Officer in planning for and coordinating a response to major public health emergencies. A current example is the planning that has been done and is ongoing regarding an influenza pandemic. The planning started with the development of the national plan by the Public Health Agency of Canada. This was followed by the development of a provincial plan and then development of a plan by each of the health authorities.

The Health Act defines the mandate of the Provincial Health Officer. As the Senior Medical Health Officer for British Columbia, this individual advises the minister and senior members of the ministry on health issues in British Columbia and on the need for legislation, policies and practices respecting those issues. The Provincial Health Officer chairs the Communicable Disease Policy Committee of the ministry, which is responsible for establishing provincial policy for this form of infection.

A subcommittee of this group focuses on the implementation of immunization policy.

The ministry's role in managing hospital-acquired infections is not usually as direct. Nevertheless, following an external review of caesarean section infection rates at Surrey Memorial Hospital in 2004, the ministry did step in and set up the Provincial Infection Control Network. The network, established under the auspices of the Provincial Health Services Authority and its agency, the B.C. Centre for Disease Control, is responsible for providing advice and strategic intervention on relevant policy, procedures and issues across the continuum of care (including hospitals, residential facilities and the community) for the province and all health authorities. The network is discussed in greater detail later in this section.

The need for such a coordinated and enhanced program of infection control across the province had been previously identified by the B.C. Centre for Disease Control.

Provincial Health Services Authority

The Provincial Health Services Authority (PHSA) is responsible for the delivery of selected province-wide health care programs and services, either through directly providing the service or through ensuring service delivery through the regional health authorities. In addition, PHSA has a province-wide role in service planning and coordination, and it assumes responsibility for allocating funds for specific programs.

The two aspects of PHSA's mandate discussed here are the work of the B.C. Centre for Disease Control and the Provincial Infection Control Network.

British Columbia Centre for Disease Control — The B.C. Centre for Disease Control has a dual role: one internal to the Provincial Health Services Authority and the other more broadly as a provincial agency. With the delegated authority from the Provincial Health Officer to monitor and report on communicable diseases and outbreaks, the centre operates six key services for the prevention, surveillance and control of communicable diseases in the province:

- Hepatitis Services
- Epidemiology Services

- Laboratory Services
- STD/AIDS Control
- Tuberculosis Control
- Vaccine and Pharmacy Services

The centre's 2004/05 performance plan, which builds on the strategic plan of the Provincial Health Services Authority, included six goals with implementation strategies. (Exhibit 2 highlights the first goal.) Each area within the B.C. Centre for Disease Control then developed goals and strategies in alignment with the overall goals of the organization.

Exhibit 2

Performance Plan Goal 1, B.C. Centre for Disease Control (BCCDC)

Goal One: Prevent, control and eliminate communicable disease and environmental hazards	
Sub Goal A – Elimination	**Strategy**
Through the application of evidenced based public health policies eliminate endemic transmission of communicable diseases – diphtheria, measles, mumps, polio, rubella, Haemophilius influenza type b (Hib), hepatitis B and syphilis.	• In partnership with the health authorities, health care providers and consumers achieve 95% childhood vaccination rates at age 2 and 7 years. These programs to include: measles, mumps, rubella, diphtheria, tetanus, polio, pertussis, Hib and hepatitis B. • Introduce the new childhood immunization programs for meningococcal C conjugate for children aged 1 year and grade 6 students, and Pneumococcal conjugate vaccine for infants. • Through the use of best practice initiatives increase the proportion of communicable disease cases found and successfully treated.
Sub Goal B – Control	**Strategy**
	• Through partnerships develop, implement, evaluate and continuously improve preventive and care management strategies in order to achieve best practice in the prevention, detection, control and treatment of communicable disease in the BC population. • Use aggressive case finding and treatment methodologies for communicable diseases, which are not amenable to vaccine prevention but are possible to eradicate through other prevention and treatment methodologies.

Goal One: Prevent, control and eliminate communicable disease and environmental hazards	
Sub Goal C – Environment	**Strategy**
Through the application of evidenced based public health policies reduce the adverse impact of environmental hazards on human health.	• With the transfer of environmental health and toxicology function from the Ministry of Health, establish an Environmental Health Service Centre at BCCDC. • Support the health authorities with environmental health expertise in order to prevent disease caused by adverse effects of the environment. • Continue to support the policy and regulatory function of the Ministry of Health. • In conjunction with WCB, explore the development of an occupational health capacity. • Strengthen and develop academic and research ties with British Columbia post-secondary institutions to enhance science related to environmental health in British Columbia. • Develop surveillance information management capacity related to environmental hazard identification, the impact of the environment on human health and the effectiveness of various prevention and abatement strategies. • Identify opportunities for improved efficiency and effectiveness of environmental health services internal and external to BCCDC.

Source: B.C. Centre for Disease Control, Performance Plan 2004/05

In addition, the centre is involved in a wide range of educational activities and research, both basic and applied. Basic research focuses on issues such as vaccine development for flu and the genetic characterization of new and emerging disease agents such as Cryptococcus, while applied research focuses on issues such as cost-effective evaluation of public health interventions (e.g., disease outbreak recognition and control).

On the staff of Laboratory Services is an Infection Control Consultant who provides education and acts a resource (e.g., developing manuals and standards) to Infection Control Practitioners across the province in a number of practice areas. Laboratory Services also does special testing. We heard the concern expressed by some interviewees who work most closely with the lab that the B.C. Centre for Disease Control's internal responsibilities as an agency of the provincial authority may erode its ability to meet its provincial role.

Providing a framework for infection prevention, surveillance and control

As part of its mandate, the B.C. Centre for Disease Control has a surveillance role that is supported by the integrated public health information system (iPHIS). The reporting component of iPHIS allows for the direct reporting of communicable diseases by the health authorities. (Appendix B provides a list of reportable diseases.) This allows the centre to monitor for clusters or outbreaks of disease and notify the appropriate officials if a cluster or outbreak is identified. The centre also issues an annual report—the *British Columbia Annual Summary of Reportable Diseases*—which is available on the website.

Currently, the centre has no direct role in monitoring nosocomial infections. However, two reports highlight the need to bring a provincial perspective to hospital-acquired infections:

- In September 2004, Laboratory Services in the PHSA developed a proposal for an enhanced Provincial Infection Prevention and Control Program that built on its current role of developing standards and guidelines, consultation, education, research, outbreak response and laboratory molecular surveillance.
- In 2004, the centre undertook a survey of 21 acute care hospitals to understand: the incidence of C. difficile; its trend over the previous four-year period; and the practices used to stop the spread. The results of the survey pointed to the difficulties in tracking nosocomial infections in British Columbia hospitals. Only 57% of solicited facilities responded and the quality and availability of the data varied among facilities and health authorities. The researchers who undertook the study concluded that infection control programs in British Columbia's hospitals vary in their capacity to conduct surveillance for C. difficile illness and lack consistent case definitions, laboratory testing protocols and infection control practice guidelines. The involvement of regional Public Health authorities in surveillance and infection control programs was also found to vary among health authorities. The final report recommended that: a provincial Infection Control Committee be established to develop standardized protocols for surveillance, laboratory testing and infection control measures for nosocomial illness; the new committee have representation from a cross-section of practitioners;

a capacity assessment be undertaken into the need to develop an integrated infection control network; and a goal of the new committee be that of enhancing the interaction between regional Public Health and infection control to allow for a coordinated community and facility response to nosocomial infections.

The review conducted at Surrey Memorial Hospital in the fall of 2004 investigating caesarean section related infections also highlighted the need for a provincial focus on infection control. We concur that there needs to be stronger provincial focus on infection prevention, surveillance and control.

Another key role of the B.C. Centre for Disease Control is in policy development. Representatives from the centre sit as members of the Provincial Communicable Disease Committee. As well, the centre has an internal Communicable Disease Policy Advisory Committee that develops policies and standards, some of which go forward for provincial approval.

Provincial Infection Control Network—The Provincial Infection Control Network (also known as PICNet) was announced in January 2005. At the time of the announcement, the Deputy Minister of Health noted that the "creation of the network will ensure a province-wide infection control system and address selected recommendations resulting from the review at Surrey Memorial Hospital." The network reports to the Provincial Medical Services Committee and is accountable to the Deputy Minister's Leadership Council. The ministry is providing the network funding for a three-year period. The Provincial Health Services Authority allocates this funding.

A Steering Committee was established to provide input and feedback to the network's Project Management Office on the project priorities required to establish a sustainable province-wide network for infection prevention and control. The Steering Committee worked with practitioners in the field (including Public Health staff, Infectious Disease Specialists, Occupational Health and Safety staff, and Infection Control Practitioners) through stakeholder summits and four working groups—needs assessment, communications, urgent/emergent issues and infrastructure design. The working groups were assigned tasks and then reported back to the stakeholders at a summit. During our audit work, we attended a summit where information was provided and issues discussed.

Providing a framework for infection prevention, surveillance and control

The needs assessment working group contracted with a consulting firm to carry out a needs assessment between November 2005 and March of 2006. Its purpose was to develop an inventory of the state of infection control across the continuum of health care to facilitate practice, identify needs and/or gaps, and prioritize these for intervention. The intent of the assessment was to provide a "snapshot" of infection control activities in the province. The report of the needs assessment working group (released after the conclusion of our fieldwork) identified three overarching themes:

1. insufficient number of skilled staff to provide infection control services;
2. inconsistent standards to enable education and training to develop the skill set for provision of infection control services; and
3. inconsistent standards in surveillance and best practices to guide those who deliver infection control services.

Each of the other working groups also moved the agenda ahead. For example, the urgent/emergent issues working group identified C. difficile-associated disease as an issue and focused on the development of a standard surveillance protocol.

Development of provincial standards and guidelines for infection prevention, surveillance and control is evolving

The B.C. Centre for Disease Control issues the *Communicable Disease Control Manual*, which is used extensively in Public Health. Chapters in the manual address: communicable disease control; immunizations; tuberculosis; sexually transmitted diseases; and infection control guidelines (e.g., for infection control in physician offices, for control of antibiotic-resistant organisms, and for managing outbreaks).

The Public Health Agency of Canada also issues guidelines (formerly issued by Health Canada) that are widely used across the province.

The Provincial Infection Control Network is also playing a role in standards development, and has highlighted the need for greater clarity regarding who "owns the responsibility for issuing and maintaining communicable disease standards and

guidelines within/amongst the health authorities." Seeking this clarification has prompted an initiative at the provincial level (under the auspices of the Provincial Communicable Disease Policy Committee) to review the governance of guidelines in infection control.

The health authorities are responsible and accountable for care delivery across the continuum of care (residential care, acute care, mental health, public health and home and community care). We therefore expected to find that planning for infection prevention, surveillance and control had been integrated across the continuum.

Conclusion

Planning for infection prevention, surveillance and control by the health authorities needs to be strengthened. None of the health authorities has an integrated plan for infection prevention and control. And, even though some have included aspects of infection control in their strategic and health service plans, it is not a focus across all services.

Findings

Strategic and health service and budget management plans place limited emphasis on an integrated approach to infection control management

Strategic and health service and budget management plans of the health authorities are meant to demonstrate alignment with the authorities' strategic direction, their Performance Agreements with the Ministry of Health, and the Provincial Health Goals.

With the exception of the Provincial Health Services Authority, we found that all of the health authorities include some aspects of Public/Population Health and communicable disease control in their plans. However, only the plans of Vancouver Coastal Health and Interior Health include some objectives or actions to enhance infection control management across other services, in particular acute care. None of the other health authorities' plans contain that information.

Providence Health Care, a partner in the delivery of acute and residential care services within Vancouver Coastal Health has a strategic plan in place for infection prevention, surveillance and control in its facilities.

Planning for infection prevention, surveillance and control by the health authorities

Direction for infection prevention, surveillance and control is clear in only two health authorities

Although not strategic plans per se, both the Vancouver Coastal Health Authority and the Interior Health Authority have established a clear direction for their infection control programs. Vancouver Coastal has set its direction through a business case to enhance infection control management throughout the authority, while an internal audit in the Interior Health Authority makes it abundantly clear what direction the health authority needs to take. However, even within these two authorities, the direction is specific to acute and residential care rather than applying to all services across the continuum of care.

The Northern Health Authority has conducted a gap analysis of its infection control program, which has also provided it with some overall direction within the confines of acute care.

The other three health authorities are taking some initial steps to better understand the needs of their infection control programs and to set some overall direction. We found none of these efforts to be well documented or to encompass all services across the continuum of care.

Public Health in all the health authorities is not a part of the infection control program and, as such, generally does its planning separately. The one area where there is an integrated approach is pandemic planning.

Demonstrating best practices in infection prevention, surveillance and control

The Public Health Agency of Canada (formerly Health Canada) has issued a number of guidelines in the area of infection control that are considered to be "best practice." In addition, guidelines from several other agencies—such as the British Columbia Centre for Disease Control and the United States' Center for Disease Prevention and Control—also outline what are considered in health care to be the best practices in such areas as staffing, facility design, surveillance and monitoring. We expected the practices in the health authorities to meet the guidelines published by these agencies.

As well, we expected the health authorities to conduct or participate in research to support the ongoing establishment of best practices.

Conclusion

The health authorities are aware that they are not demonstrating best practices in all aspects of infection prevention, surveillance and control and the majority are taking steps to remedy the situation. However, the urgency to change practice varies from one authority to another.

Findings

Infection control/communicable disease guidelines are available to staff, but the infection control guidelines for acute and residential care are not standardized within each health authority

Infection control policy and procedures manuals provide staff guidance in dealing with specific infections. These manuals are available in most health authorities either in print copy or online (where information systems are available) to all departments and programs. However, we found that the manuals are not necessarily consistent within any one health authority or kept up-to-date. The manuals did not provide sections specific to other services such as mental health, addictions and home and community care.

The existing manuals in most health authorities reflect the previous regional health care delivery structure. New authority-wide manuals for acute and residential care are under development. Progress on these has been slow, however, because infection control resources for such project work have

Demonstrating best practices in infection prevention, surveillance and control

been constrained. Only Northern Health has an updated acute care manual available throughout the authority.

Within all health authorities, we found that any new policies that are developed or old policies that are revised are done so for the health authority as a whole.

Although all health authorities are devoting resources to the development of their manuals and using the expertise of the Infection Control Consultant at the B.C. Centre for Disease Control, we found limited collaboration among the health authorities in this undertaking. This may change soon, in light of discussions within the Provincial Infection Control Network regarding policy development.

We heard from all health authorities that staff do use the manuals as a resource, as well as accessing the Infection Control Practitioner when questions arise. We also heard that physicians are aware that manuals are available, though they generally do not use them. Instead, they contact the Infection Control Practitioners or another medical practitioner familiar with infection issues when seeking information.

For Public Health provincially, the Communicable Disease Control Manual is available online from the B.C. Centre for Disease Control and a hard copy is available in all Public Health offices. Updates or changes to the policies are sent out by the centre and then it is up to each Public Health office across the province to ensure those changes are communicated to staff.

Resources and attention are being directed to infection control in support of meeting best practice standards, but overall it is not adequate

With the exception of PHSA, we found that all the other health authorities are making changes to their infection control programs. This is occurring as a result of either the authorities' own internal reviews or external reviews. Some are further along than others. For example, Interior Health has hired a significant number of Infection Control Practitioners and changed its structure. Vancouver Island Health, on the other hand, has instituted a new Quality and Patient Safety Portfolio with co-directors (Medical and Administrative) who are just in the initial stages of reviewing the infection control program.

Demonstrating best practices in infection prevention, surveillance and control

Infection Control Organization

The structure of infection control programs varies across the health authorities, but there are some key similarities. For example, with the exception of Interior Health, all have a senior medical lead in place who is a member of the senior executive team. As well, all have made the Chief Medical Health Officer a member of the senior executive team. (Fraser Health was the last to do this, making the change just at the end of our fieldwork). In none of the health authorities is Public Health considered part of the infection control program. And in none of the authorities is clerical support adequate.

A number of groups within the health authorities are key to an infection control program. We summarize our findings about them below.

Infection Control Committees

Medical staff play a key role in infection control, usually through the medical staff organization and committee structure of the health authority. Medical Staff Bylaws in each authority give the Health Authority Medical Advisory Committee the responsibility and accountability for the quality of medical care.

We found that all of the health authorities with the exception of PHSA have (or were in the process of putting in place) an authority-wide medical Infection Control Committee. These committees are accountable to the Health Authority Medical Advisory Committee.

The health authorities also have in place local Medical Advisory Committees either at a site level or sub-regional level (referred to as Health Service Areas or Health Service Delivery Areas). Some of these have Infection Control Subcommittees. All of these committees (as with the authority-wide committees) have representation from a cross-section of medical staff, as well as Infection Control Practitioners and staff from other areas of the authority (e.g., Occupational Health and Safety, Operating Room, Public Health, and Housekeeping).

The authorities also have non-medical Infection Control Committees in place that are made up of Infection Control Practitioners and where available the Infection Control Officers. These committees focus on the day-to-day operations, and take some of their direction from the authority-wide Infection Control Committees.

Functioning of the medical committees varies significantly both within and across the health authorities. Some committees, such as those in Vancouver Coastal Health, are functioning well—receiving reports, monitoring issues and initiating action as appropriate. Others, such as the medical Infection Control Committees in Fraser Health, function at different levels of effectiveness. Some site committees within the authority are very active while others have stopped meeting (possibly the result of some confusion over changing committee structures).

Infection Control Practitioners and Communicable Disease Nurses

The number of certified Infection Control Practitioners required for a comprehensive program has not been firmly established, but the general guideline is 1 for every 150–175 acute care beds and 1 for every 150–250 residential care beds taking into consideration the complexity of care. There are no clear guidelines to indicate the number of practitioners required to support other programs such as community mental health and home care programs. However, infection control experts have stated that there is a need for an Infection Control Practitioner's knowledge and expertise in the community.

Both Vancouver Coastal Health and Interior Health recently conducted formal reviews of their infection control programs, including assessing what the ratio should be of Infection Control Practitioners to beds. The two reviews identified a need for a significant increase in the number of Infection Control Practitioners. Both organizations went on to approve the hiring of the additional practitioners, but only Interior Health has hired the full complement. We noted, however, that despite this additional staff, limited support is being offered to those programs outside of acute and residential care.

Other health authorities have hired (or are in the process of hiring) some additional staff, but the hiring is not based on an assessment of a practitioner per bed ratio.

We also found that in some cases—and appropriately so—a higher practitioner-to-bed ratio has been established. At Women's and Children's, for instance, there are 3.5 full-time equivalent (FTE) Infection Control Practitioners for 318 beds: a practitioner-to-bed ratio of 1:90. This ratio exceeds the guidelines and was put in place as a result of an outbreak of methicillin resistant staphylococcal aureus (MRSA) in 1999/2000. With the highest need and most fragile babies in the newborn intensive care nursery, one case of MRSA can be devastating. Therefore, increased monitoring and increased services are needed everywhere in Children's and Women's to reduce the risk of infection in the nursery. The Infection Control Practitioners are also available to support Children's and Women's community programs such as prenatal homecare for managing a mother at risk during the prenatal period, and Healthy Beginnings—a postpartum program for high-risk mothers in the after-birth period.

While the health authorities contract with third-party providers of residential services, we found that only Vancouver Coastal Health has Infection Control Practitioners in place to support infection control management in its contracted facilities. Fraser Health does have an Infection Control Practitioner in place that supports the contracted facilities, but that practitioner is not part of the infection control program, instead operating within the portfolio responsible for monitoring the third-party contracts.

All health authorities have position descriptions in place for their Infection Control Practitioners. However, those descriptions vary in how up-to-date they are and in the required qualifications they list. That said, all the authorities (with the exception of Fraser Health) require their Infection Control Practitioners to be—or to become—certified and to maintain their certification (re-certification is required every five years).

We add that the Infection Control Practitioners across all health authorities should be acknowledged for their efforts in trying to maintain good infection control management in the face of limited resources and what has been limited support from their organizations.

There is no defined ratio of Communicable Disease Nurses to population. However, with Public Health nurses administering increasing numbers of vaccines to prevent diseases, less time is

available to perform surveillance and control. We were told that timely follow-up of people with communicable disease and their contacts is presently a challenge. Thus should an outbreak of disease occur Public Health would not have the additional capacity to respond adequately.

Medical Infection Control Officers

Medical Infection Control Officers provide medical leadership both in the day-to-day functioning and long-term planning of infection control programs.

We found that the health authorities differ greatly in how they have structured the medical support for their programs. All except for Fraser Health and Northern Health have designated Infection Control Officers. (At the time of our fieldwork, Fraser Health was moving to put a designated Infection Control Officer in place.) Although not having designated Infection Control Officers, both Fraser Health and Northern Health provide their Infection Control Practitioners with medical support from other physicians such as pathologists or the chairs of the local Infection Control Committees.

Medical microbiologists and pathologists supported by the laboratory staff play a key role in the infection control program, as they are instrumental in diagnosing infectious organisms and understanding their susceptibility or resistance to antibiotics.

We also found that the Medical Health Officers in all health authorities are providing guidance and advice to the programs as needed, although Public Health remains separate from the infection control program.

Workplace Health and Safety Staff

Although not directly part of the infection control program, the Occupation Health and Safety/Employee Wellness Departments in all health authorities work closely with the program because it is responsible for staff health. This may involve ensuring that staff are up-to-date with their immunizations; that precautions are in place to protect staff from contracting communicable diseases (e.g., fitting staff for a special mask referred to as N95, which is used to protect against potential airborne pathogens); and that appropriate steps are taken if staff become infected with an organism such as during an outbreak. Staff from Occupational Health and Safety also participate

on the Infection Control Committees at the regional level, at the site level or at both levels.

Occupational Health and Safety's policies are available to staff either on the intranet or in manuals (for those areas of the authorities having limited intranet access).

In some health authorities, the line between responsibilities for Occupational Health and Safety and Infection Control Practitioners is blurred on occasion. Part of the reason is that some Infection Control Practitioners also do staff immunizations and conduct fit testing for the N95 mask.

Physical Environment

There is evidence that the built environment may influence the incidence of infections in facilities. The built environment refers to: the type of rooms—single versus multi-patient; the ability to isolate patients for airborne and non-airborne organisms; the location and number of sinks; the types of surfaces; the ability to separate clean and soiled equipment; and the availability of waterless hand washing stations.

In all health authorities, we heard that the differences in facility age and design is affecting the availability and location of sinks for hand washing, the ability to isolate patients and, in some areas, the ability to separate clean and dirty equipment. These differences in facilities are also evident within authorities. For example, the tower at Vancouver General Hospital has 108 negative pressure rooms (for isolating patients), but Squamish General Hospital has none. Emergency rooms across the province were also frequently identified as having no or limited ability to isolate patients.

However, we also heard that initiatives are underway in many areas to try to mitigate the risks created by the age and design of facilities. Most authorities are putting an emphasis on increasing the supply of negative pressure rooms through new construction, upgrades or the installation of portable pumps.

The differences in age and design also apply to residential care facilities, where the greater impact is in the lack of sinks. Residential care facilities are most often considered a home and, as such, infections are managed differently. If a single room is available a person may be isolated, but if not, residents with the same infection will be cared for in the same room.

Demonstrating best practices in infection prevention

Most of the authorities have a policy in place that requires Infection Control Practitioner involvement in construction and renovation projects. However, actual inclusion at each stage of a project may not always happen and it varies by site even within a health authority. The policies in place related to Infection Control Practitioner involvement in construction and renovation projects are structured similar to those described in the Standards Council of Canada standard "Infection Control During Construction or Renovation of Health Care Facilities." (Appendix C provides more detail on this standard.)

All of the health authorities have installed waterless hand hygiene dispensers throughout their facilities to help promote hand washing by staff and visitors and to decrease the risks created by the lack of sinks in some facilities and the ease of accessibility in others.

Supplies

Adequate supplies to manage infections are needed to protect staff from infected patients and to protect fragile patients from staff. In the health authorities, departments and programs are responsible for supplies. However, the Infection Control Practitioners are responsible for ensuring that any products used to manage infection control are suitable and offer protection to both clients and staff.

We heard from interviewees across the health authorities that gloves, gowns and masks are, for the most part, readily available as needed. Staff working in programs outside of facilities also carry appropriate supplies with them.

Orientation for new employees includes education about infection control

All health authorities provide an orientation to new employees, which includes a component on infection control. While this component varies by health authority, generally it includes information on hand washing and isolation practices.

As well as the general orientation, additional infection control orientation is provided to specific staff (such as nurses) and sometimes to specific work units.

No formal orientation is offered for new physicians joining the medical staff of the health authorities. In some authorities, there may be a tour of the facility where the physician will be practising, but nothing provided regarding infection control. Vancouver

Coastal Health and Fraser Health, for example, both indicated that they do provide a basic orientation to new interns and residents on infection control practices.

Ongoing education for staff regarding infection control is ad hoc

Ongoing staff education on infection control varies across sites within the health authorities. The topics and approach depend on the Infection Control Practitioner and the needs of the staff or the organization. Education on a particular topic may be provided either on a formally scheduled basis or on a one-to-one, informal basis. The more informal education usually occurs when the Infection Control Practitioner is attending to an issue in a particular department or area. Sometimes he or she will also be invited to a unit or department meeting to provide education on a topic or will make a request to attend a meeting to provide education on a particular issue. In some health authorities, the Infection Control Practitioner may also work with Clinical Nurse Educators or supervisory staff who in turn educate the staff on infection control.

Within the Vancouver area, Vancouver Coastal Health provides, a mandatory annual staff update on a variety of topics including infection control. In addition, it developed (in conjunction with experts in infection control, adult education, and information technology from the Provincial Health Services Authority and the Occupational Health and Safety Agency for Healthcare in British Columbia) an on-line learning module on infection control. Through a grant from the Canadian Nursing Advisory Committee, the module was pilot tested within Vancouver Coastal Health and Provincial Health Services Authority. The initial feedback was positive and encouraging, but it was felt that further assessment was required. The committee has since received a grant from the Canadian Institute of Health Research to conduct a three-year study of infection control on-line learning. The key objectives are to:

- ascertain the accessibility, usability and user satisfaction of the on-line infection control module;
- evaluate the ability of the on-line module to successfully transfer infection control knowledge to health care workers across the health care continuum; and
- evaluate the ability of the on-line infection control module to effect change in self-reported infection control practices among health care workers.

It is anticipated that the information obtained in the project will be valuable when other on-line modules for health care workers need to be assessed.

The provincial "Infection Control Week" in October also provides another opportunity for staff education. Each health authority acknowledges the week in a different way, but usually includes education sessions, posters, and even contests as a means of increasing staff awareness of issues.

The use of newsletters is another method that many health authorities use to educate staff about infection control practice.

We found no ongoing education related to infection control for medical staff in any of the health authorities. However, all authorities require medical staff continuing education, and infection control—like any other topic—can be added to the schedule. Infection control issues may also come up as part of morbidity and mortality rounds or grand rounds, or be a topic of discussion at departmental or medical staff meetings. As well, in most health authorities, the Medical Health Officers try to keep medical practitioners up-to-date on emerging pathogens and changes in communicable disease issues through a variety of means (newsletters, emails, faxes and attendance at meetings).

All the physicians we interviewed indicated that they gain knowledge about issues of infection control through reading, accessing the Internet, and attending conferences.

Support for Infection control practitioner education and educational opportunities needs to be strengthened

The health authorities all vary in their support of education for their Infection Control Practitioners. Interior Health, with the assistance of a consultant, has developed a two-year learning and work experience plan for its novice practitioners, a plan that is directed at supporting the preparation of the novice practitioners to write the certification exam following their two-year work experience. In addition, the health authority supports all its novice practitioners by paying their enrolment fees in an infection control course for new practitioners at the University of Calgary. Northern Health, however, has no planned financial support for its novice practitioners.

For more experienced practitioners, there is no requirement for them to pursue a set number of hours of continuing education. Rather, ongoing education is usually self-directed: What am I interested in and where do I need to increase my knowledge? Infection Control Practitioners use a variety of formal and informal educational opportunities to maintain and increase their knowledge. Formal educational opportunities include: conferences, workshops, and online courses. We found that how often practitioners are able to access this type of formal education varies by health authority and depends on available time and resources. The business case for additional resources in Vancouver Coastal Health's Infection Control Program estimated $8,000 per year for one Infection Control Practitioner educational opportunity per site. Informal opportunities include professional association meetings, journal reading and interaction with peers and medical practitioners.

As well, we found that the authorities subscribed to Webber Teleclasses, which are education sessions on a variety of topics relevant to Infection Control Practitioners. Examples of topics include: Measuring the Cost of Hospital Infection—Measuring the Value of Hospital Infection Control; Emerging Infectious Diseases; and Disinfectants and Environmental Impact.

All of the health authorities except Fraser Health require their Infection Control Practitioners to be certified and to maintain their certification. Maintenance of certification requires the practitioners to write and pass a re-certification exam every five years. This helps to ensure that the practitioners keep up-to-date on issues related to infection control. However, financial support and the time to pursue re-certification are not always provided by the health authorities.

Public Health Nurses responsible for communicable disease control must also stay current. To do so, they use many of the same formal and informal methods as the Infection Control Practitioners do. Those nurses responsible for immunizations must be certified, which means they must pass an exam and be observed setting up a clinic, assessing clients, giving vaccinations and documenting their work in the public health information system. Recertification must occur every three years and Public Health Nurses are supported in all health authorities to do this.

For physicians who directly support the infection control programs, knowledge is gained by attending conferences, attending rounds, reading journals and conducting research.

Demonstrating best practices in infection prevention, surveillance and control

Surveillance of infections and monitoring of infection control practices are weak overall, but there is increasing awareness of their importance.

In this audit, we looked at monitoring from two perspectives: surveillance—the ongoing, systematic collection, analysis and interpretation of data for use to improve health outcomes; and the direct observation or audit of practice (such as hand washing or gowning). In addition we looked at the mechanisms each authority has in place for monitoring any third-party contracts that have implications for infection control.

Surveillance

We found surveillance weak within the health authorities and that it varied across each service delivery area and even by site, apparently depending on the availability, skill and knowledge of the Infection Control Practitioners and the medical support for the program (either through a designated Infection Control Officer, a lead medical microbiologist, or chair of an Infection Control Committee). The health authorities are aware that their surveillance of infections is weak, but the need to address the issue has not been identified as a high priority in several authorities.

Vancouver Coastal Health is one of the authorities that is well aware of the variation in practice across its region and it is actively moving to develop a standardized regional surveillance program. The health authority hired a hospital epidemiologist as a member of the infection control team who is tasked with developing the regional surveillance program. The overall goals of the program will be to:

- establish baseline rates and monitor trends over time;
- detect outbreaks;
- generate and test hypotheses concerning risk factors;
- assess the impact of prevention and control measures; and
- reduce health care-associated infections.

We think that the goals of this particular program are applicable to all of the health authorities as they move forward and put in place regional surveillance programs. However, not all will have an epidemiologist to lead a surveillance program nor is establishing surveillance dependent on having an epidemiologist on staff, although that skill set is important for surveillance.

Demonstrating best practices in infection prevention, surveillance and control

The spread of "super bugs" has focused the attention of the health authorities on three particular organisms: methicillin-resistant staphylococcus aureus (MRSA), vancomycin-resistant enterococcus (VRE), and antibiotic-resistant organisms (AROs). Surveillance of these organisms is undertaken in all the health authorities, but because even for these the data definitions are not standardized within authorities, there is not always a clear picture of what is happening across each authority. Nevertheless, we did note that steps are being taken in most health authorities to ensure that standard data definitions are in place. Another organism that is monitored in most health authorities is clostridium difficile associated disease.

All of these organisms have a significant impact on those that contract them, including the possibility of death. There are also large financial costs to the health authorities in having to manage these organisms (costs that can be reduced through good infection control practices). Yet, because there is a lack of surveillance, we found that the health authorities do not know overall how much these organisms are costing them. Some recent costing exercises have shown, however, how costly the major organisms can be (see below for examples).

The Cost of Treating Specific Organisms

When the infection control program at Vancouver Coastal Health developed its 2004 business case for increased resources for infection control, it provided data regarding the costs of methicillin-resistant staphylococcus aureus and vancomycin-resistant enterococcus. Using four years of data (which includes some estimates because of a lack of data at some sites), it was estimated that managing patients in the region infected with these organisms cost over $24 million for the period 2000 to 2003.

Vancouver Coastal Health, (using data and findings from the Canadian Nosocomial Surveillance Program which had estimated that 7% of all C. difficile associated disease (CDAD) cases result in readmission, staying on average 13.6 days at a cost of $900/day and $5,800 for treatment costs), estimated that for 2002/03 it had cost over $3 million to treat readmitted patients with CDAD (total cases were 2,526). There is also significant morbidity associated with these organisms.

The Infection Control Practitioners at Fraser Health did a similar costing exercise and concluded that from April 1, 2003, to March 31, 2005, treating patients with MRSA and VRE cost the health authority over $11 million. As well, CDAD readmissions, it estimated, cost almost $1 million.

While we expected there to be surveillance of surgical site infections, we found that this type of surveillance also varied by site across the authorities. Vancouver Coastal Health and Vancouver Island Health (South Island only) have the most robust programs of surgical site infection surveillance in place, although even in these

authorities the surveillance does not include all sites. Only because of the review of caesarean section (c-section) infections at Surrey Memorial Hospital are all health authorities monitoring c-section infection rates in response to a ministry directive.

All of the health authorities are participating in a national safety initiative called "Safer Healthcare Now!" which is focused on six targeted interventions. (Each of these has an evidence base indicating that appropriate implementation and practice can lead to reduced mortality and morbidity). This initiative is patterned on the Institute of Health Improvement's "100,000 Lives" campaign in the U.S.A.

Of the six targeted interventions, three are connected to infection control: Prevention of Central Line-Associated Bloodstream Infection, Prevention of Surgical Site Infection (selected surgeries), and Prevention of Ventilator-Associated Pneumonia. For each of the interventions, a kit explains the key components, or bundles, of care; the changes that might be made to implement the care requirements; the standardized data to be collected; and the calculations to be completed, analyzed and reported. Involvement in the initiative also requires that baseline data be collected on current infection rates in these areas so that the health authority has some sense of where it is starting. Exhibit 3 provides an excerpt of the information provided for one of the components of care related to preventing ventilator-associated pneumonia.

Exhibit 3

Excerpt from an information kit describing a care component for preventing ventilator-associated pneumonia (VAP)

Components of Care

1. Elevation of the Head of the Bed

Elevation of the head of the bed is an integral part of the VAP Bundle and has been correlated with reduction in the rate of ventilator-associated pneumonia. The recommended elevation is 30 – 45 degrees. While it is not immediately clear whether the intervention aids in the prevention of ventilator-associated pneumonia by decreasing the risk of aspiration of gastrointestinal contents or oropharyngeal secretions, this was the ostensible reason for the initial recommendation. Another reason that the intervention was suggested was to improve patients' ventilation.

What changes can we make that will result in improvement?

Some changes are:

- Implement a mechanism to ensure head-of-the-bed elevation, such as including this intervention on the nursing flow sheets and as a topic at daily multidisciplinary rounds.
- Include the intervention on standard orders for the initiation and weaning of mechanical ventilation, delivery tube feedings, and provision of oral care.

Source: Safer Healthcare Now! Campaign How-to-guide, *Prevent Ventilator-associated Pneumonia* (February 2006)

Public Health's surveillance of communicable diseases is ongoing. It is a regulatory requirement for health care professionals and others to alert Public Health staff to any client they have assessed with a disease designated as reportable. Appendix B provides a list of current reportable diseases in British Columbia. Public Health in turn provides surveillance reports to the B.C. Centre for Disease Control, which receives the reports on behalf of the Provincial Health Officer (the centre then reports these diseases to the Public Health Agency of Canada). In addition, Public Health monitors immunization rates and any adverse events that may occur. This information is also reported to the centre.

Contract Monitoring

Four of the health authorities (Provincial Health Services, Vancouver Island Health, Vancouver Coastal Health and Fraser Health) have contracts with providers of housekeeping services. All of the contracts contain provisions for infection control. For example, all require the contractor to provide staff training in infection control, as well as ensure that staff are properly

immunized. The health authorities have also put committees in place to address any issues that may arise regarding standards, compliance or contract staff responsiveness. In addition, we found that Fraser Health has put in place Service Level Agreements. These agreements, between specific departments and the contractor describe more detailed cleaning requirements and response times as a means of increasing the understanding by both the authority's staff and the contractor's staff about their responsibilities.

All of the contracts allow for audits, planned and unplanned.

Except for PHSA and Northern Health, we found that all of the health authorities have contracts with providers of residential care services. We were not provided access to the contract at the Vancouver Island Health Authority. However, of the contract templates that we did review, only Interior Health's had a specific requirement as part of its Performance Management Framework that the contractor have in place: infection control policies and procedures; a wound management policy and procedure; a risk management plan; and a staff training plan before opening.

We also found that all of the contracts require the contractor to be in compliance with legislation (including for example, the Community Care and Assisted Living Act) and to maintain or obtain accreditation with the Canadian Council of Health Services Accreditation (CCHSA). In addition, Public Health is responsible for inspecting residential care facilities and following up on any issues related to care.

Both Interior Health and Vancouver Island Health have contracts with third-party providers of surgical services. The contracts that Interior Health has in place with its providers requires them to comply with policies and standards of the Ministry of Health, the health authority and the standards of CCHSA or other applicable accrediting body as approved by the health authority. The provider also agrees to report all critical incidents (including mortality or major complications or outbreak of infections) and, if requested, to provide evidence that its facilities are certified for all aspects of mechanical design (including, for example, medical gas, air flow and humidity). We were not provided a copy of the surgical services contract from Vancouver Island Health.

Vancouver Coastal Health has also entered into a contract with a provider for the reprocessing of medical instruments. There is no

requirement for the provider to report any machinery breakdown that may impact the sterilization process or any test results to ensure that its equipment is functioning properly. However, the contractor does warrant that it will perform its services in accordance with the U.S. Food and Drug Administration Quality System Regulation. The contractor guarantees the sterility of reprocessed medical instruments unless the packaging of the medical instrument has been opened or damaged and the functionality of the reprocessed medical instruments until such instruments have been used in one medical procedure.

Practice Monitoring

It is well documented that hand washing is the best line of defence against the spread of infectious organisms. We therefore expected to see the formal monitoring of practice such as hand washing or use of gloves. Instead, we found that the monitoring that is done is more informal in that if the Infection Control Practitioner is in a department and notices staff using gloves improperly, he or she will point it out. This type of informal monitoring is also said to be done by departmental managers. Although informal monitoring is beneficial, we believe a formal mechanism should be in place to monitor hand washing.

Being well aware of this, Vancouver Coastal Health supported by Bayer HealthCare, has been in the initial stages of a year-long hand washing campaign, "Clean Hands for Life" (based on a World Health organization initiative). The campaign takes a multifaceted approach, the effectiveness of which is measured. For example, at Providence Health Care, hand hygiene audits are to be conducted. At other Vancouver Coastal Health facilities, staff are completing pre- and post-campaign surveys. In addition, the consumption of hand hygiene products (e.g., paper towels, hand soap and waterless hand gel) is to be measured. As well, Fraser Health was just completing a formal hand washing audit in all its acute care facilities when we were completing our fieldwork. (Some of the results of that audit are summarized in the sidebar on the following page) Exhibit 4 provides the definitions of compliance used by the audit.

Highlights from a Hand Washing Audit, Fraser Health Authority

In 2006, Registered Nurses were recruited and trained to record the hand hygiene activities of staff and hospital visitors. Of the 1,825 observations made of hand washing compliance before patient contact, 67% showed people not doing any hand wash at all, 22% were partially compliant and only 11% were fully compliant.

The audit also measured hand washing compliance before and after an invasive procedure (including Foley catheter insertion, suctioning, drawing blood, peripheral IV start, intubation). There were 263 observations made before a procedure and 292 after a procedure. The results showed that 74% of individuals did not do a hand wash before the procedure and 44% did not do a hand wash on completing a procedure. Seven percent were fully compliant before a procedure and 22% after a procedure; and 19% were partially compliant before a procedure and 34% were partially complaint after a procedure.

The results are also provided by facility and by professional designation.

Exhibit 4

Hand Washing Audit Definitions of Compliance

Full hand hygiene compliance – includes all FHA recommended steps for either hand washing or the use of alcohol gel:

Hand wash comprises of 5 steps:

- Wash hands for 15 seconds with friction
- Apply soap
- Rinse under water
- Pat dry with paper towels
- Turn off taps using paper towel (unless hand-free)

For alcohol gel:

- Rub hands with alcohol hand gel for 15 seconds while using friction.

Partial hand hygiene compliance – does not meet the entire FHA standard but shows an attempt at recommended steps:

- Hand wash includes some but not all of the 5 recommended steps.
- Using alcohol hand gel for less than 15 seconds while using friction.

Hand hygiene not done – indicating no hand wash was attempted at all.

Source: Fraser Health Hand Hygiene Audit Provisional Report for Observations Recorded between October and November 2005 (draft: March 2006)

The results of the audit are to be used as a baseline measurement for Fraser Health hand hygiene performance improvement. To increase awareness for appropriate hand hygiene practices, facility-specific campaign posters have been designed and plans are underway to develop education sessions. We believe the results of

this audit are serious enough that all the health authorities should undertake their own review of this basic standard of good practice.

Antibiotic use is another aspect of monitoring—one that occurs predominantly in acute care facilities. As for many of the other aspects of infection control, we also found this to vary in practice by health authority. Each authority's medical structure has a Pharmacy and Therapeutics Committee that usually has some responsibility for antibiotic use. Day-to-day monitoring in most facilities, however, may be done by a variety of people, depending on the authority and the site, and may include medical microbiologists, Infection Control Practitioners and pharmacists. Any identification of inappropriate use or ordering is handled differently in each health authority, although the first step in most is to bring it to the attention of the physician involved.

The health authorities also have policies in place to support appropriate antibiotic uses, such as automatic stop-orders and subscribing restrictions.

Public Health in some health authorities is participating in the "Do Bugs Need Drugs?©" program, an initiative that started in Alberta and is directed at educating the public about antibiotic resistance and the appropriate use of antibiotics. The program promotes three key messages:

- Hand washing is the best way to stop the spread of infections.
- Not all bugs are created equal. Both bacteria and viruses cause respiratory tract infections. Antibiotics work against bacterial infections and not against viral infections such as colds and flu.
- Antibiotic resistance is a problem. Use antibiotics wisely to prevent bacteria from becoming resistant to antibiotics.

External Monitoring

All of the health authorities participate in the annual provincial housekeeping audit conducted by WesTech Systems FM, Inc. and reported publicly by the health authorities. This audit is based on cleaning outcome standards and risk categories for areas of the facilities (e.g., rooms categorized as very high risk, such as an operating room have a low tolerance for unclean inspection elements). The best practice benchmark is 85%. The initial audit was conducted in May 2005. Exhibit 5 provides the summary results of this audit for each health authority.

Exhibit 5

Summary Housekeeping Audit Scores, by Health Authority

Summary Results (Average Score)	Score %
Fraser Health Authority	86.14
Interior Health Authority	90.36
Northern Health Authority	88.43
Provincial Health Services Authority	85.22
Vancouver Coastal Health Authority	87.64
Vancouver Island Health Authority	84.46
All Health Authorities	**87.04**

Source: *Report and Results for Third-Party Independent Unannounced Housekeeping Audit of BC's Health Care Facilities*, performed by WesTech Systems FM, Inc. March 1 to May 31, 2005. WesTech Systems, FM Inc. (June 22, 2005)

The health authorities also participate in the accreditation process of the Canadian Council on Health Services Accreditation (CCHSA), a national, non-profit, non-government independent body that offers health organizations a voluntary, external review process to assess quality by developing national standards, assessing compliance with those standards and sharing the information from the reviews and decisions. The accreditation review process, which can be done for the authority as a whole or sequentially over a three-year period looking at specific programs, highlights both strengths and areas for improvement. The accreditation standards for the environment include several that are specific to infection control.

All the health authorities have recently been involved in the accreditation process and those that had received their reports included recommendations specific to infection control. The recommendations are outlined in Exhibit 6.

In 2004, Vancouver Island Health received a recommendation from the CCHSA that it "develop and implement an organization-wide risk management model that promotes identification, aggregate data collection, analysis, required action, monitoring activities to prevent and or/mitigate the results of risks." In preparation for its 2005 survey, the authority's own

environment team assessment identified several major risk areas that urgently needed to be addressed, including infection control. The accreditation report for 2005 was not available at the time of our fieldwork. Fraser Health's report was also not available at the time of our fieldwork

Within the Provincial Health Services Authority, Children's and Women's participated in the accreditation process in 2004, but no recommendations were received regarding infection control. Riverview and Forensics are scheduled to take part in the process in 2006.

Exhibit 6

Accreditation Recommendation by Health Authority

Health Authority	Recommendation	Review Date
Vancouver Coastal	(Patient Safety – Acute Surgery): "It is recommended that the team work with the region to enhance the infection control program to ensure consistent application across all sites, including the rural sites. This program needs to include monitoring, awareness and education."	Oct./Nov 2004
Interior Health	"Implement formal infection control procedures across the system to ensure a consistent approach to preventing and controlling infections."	June 2005
Northern Health	"Develop strategies to ensure that an acceptable level of infection control is in place at all sites. These strategies should include staff education and training and the implementation of policies and procedures for all levels of service."	June 2005

Source: Compiled by the Office of the Auditor General (2006)

Research is conducted in support of best practices

Research provides organizations the opportunity to learn more about the risks of infections and communicable diseases and about the practices needed to mitigate the risks. It also provides the opportunity to determine best practices.

Not all of the health authorities are conducting or participating in research, but we did find numerous examples of involvement. Vancouver Coastal Health, an affiliate of the University of British Columbia, is the most active. The sidebar highlights two proposals that the health authority is involved in or seeking funds for.

Two research proposals of the Vancouver Coastal Health Authority

- One proposal is to the Canadian Patient Safety Institute, to fund a demonstration project for an, "Early Identification System for the Prevention and Control of Potentially Transmissible Infections in Acute and Long Term Care Facilities." Early recognition of patients with suspected transmissible infections, combined with timely implementation of appropriate infection control protocols, are key to preventing and controlling the spread of pathogens. The project therefore proposes to monitor inpatients in acute and affiliated long-term care facilities using a combination of syndromic surveillance algorithms, patient history, presenting complaint and lab data, and daily ward review. This work would build on previous work done by the authority in the area of syndromic surveillance. Evaluation is to involve: 1) assessing the effectiveness of the system in reducing the number of exposure events to patients; 2) ascertaining the predictive accuracy of the respiratory and gastrointestinal algorithms; and 3) evaluating the effectiveness of staff training and provision of ongoing feedback on completeness and appropriateness of infectious disease flagging.
- The other proposal is linked to the hand hygiene campaign discussed under Practice Monitoring. The proposal was submitted to WorkSafe BC for funding to support a senior researcher to collect and analyze the data from health care worker focus groups, surveys and poster contest submissions during the year-long campaign.

  The purpose of this project is to measure the effectiveness of specific aspects of the campaign on health care workers' knowledge, attitudes and intent to comply with hygiene guidelines. Specific objectives of the research are to identify: 1) individual, environmental and organizational factors that influence workers' intent to comply with health care facility hand hygiene guidelines; 2) differences in beliefs and attitudes towards hand hygiene between various groups of workers and patient/residents; and 3) factors that contribute to the success and/or failure of a regional hand hygiene campaign.

In Northern Health, the Public Health Nurses are involved in a national research initiative examining the beliefs and attitudes of staff that may or may not encourage others to be immunized. Vancouver Island Health (South Island) has received federal funding to track disease rates and behaviours of downtown injection drug users.

Information systems support of infection prevention, surveillance and control

A key requirement of a comprehensive infection control program is that it enables access to good data so that health authorities can know who has infections, what the infection rates are, and where the infections are occurring. We expected the health authorities to have information systems in place to support infection surveillance and control.

Conclusion

The information system in place in the health authorities is inadequate to support their infection control programs. Only Public Health in all the authorities has a system that supports its programs.

Findings

The health authorities do not have software in place to support infection surveillance, with the exception of Public Health and Occupational Health and Safety.

The 2001 regionalization of health services resulted in each of the newly created health authorities inheriting a number of stand-alone systems that did not interface.

We found that all of the health authorities have since put information management plans in place, but there are no modules to directly support the infection control program. The authorities recognize this gap and some are taking action to provide information management support to their infection control programs.

At the time of our fieldwork, Vancouver Coastal Health was in discussion with a software developer about a product to support regional surveillance of nosocomial infections. The program is expected to capture information about patients, residents, and their "encounters" with acute care facilities, as well as about the long-term care facilities owned and operated by the authority and about relevant infection "events."

Interior Health, as a result of its audit of infection control, recognized that it needed to provide information system support for the program. As a result, the authority created a steering group to investigate and recommend a suitable software program to support surveillance, analysis and reporting. The group's recommendation

to the senior executive team was accepted and a budget of approximately $1.3 million was approved over a two-year period, including about $700,000 to begin implementation of the software in 2006.

Public Health has an information system in place in each health authority and this system links provincially. Called the Integrated Public Health Information System (iPHIS), it is hosted by the Provincial Health Services Authority and B.C. Centre for Disease Control. It tracks immunization records as well as communicable disease reporting as determined by the Health Act and its regulations. Vancouver Community and Richmond Public Health (within the Vancouver Coastal Health Authority) do not use iPHIS, but collect their information on a system called PARIS (the Primary Access Regional Information System). PARIS links with iPHIS.

Each health authority also has a system in place to support data collection and analysis in their Occupational Health and Safety Departments. These systems support the tracking and monitoring of staff infections and immunizations. The two software products in use in the authorities are the Workplace Health Indicator Tracking and Evaluation (WHITE) system and Parklane.

Tracking and trending of data to identify clusters of infections or emerging issues and benchmarking to standards are problematic

Lack of information system support and of quality assurance processes to ensure standard data definitions have resulted in differences in data collection within and across each health authority. For example, Interior Health collects information at the level of the Health Service Area (the site level), but the information is not brought together to provide a picture of infections in the whole authority. A similar situation exists in Northern Health and Vancouver Island Health.

Even Vancouver Coastal Health, which collects data from all areas, has only recently standardized its data definitions for methicillin-resistant staphylococcus aureus (MRSA), vancomycin-resistant enterococcus (VRE), and C. difficile associated disease (CDAD). Fraser Health has also taken steps to improve its data collection for MRSA, VRE and CDAD across all its acute care sties, and therefore will be able to be more confident in its tracking and trending and benchmarking these infections over time.

Information systems support of infection prevention, surveillance and control

The two sites we examined within the Provincial Health Services Authority each have their own data collection methods.

The health authorities have recognized that there are problems in data collection within their boundaries and across the province. They are taking steps to address these. As well, the Provincial Infection Control Network is making some efforts to standardize protocols across the province.

Communicable disease data collection is standardized across the health authorities

The Integrated Public Health Information System (iPHIS) is in use across the province (except in Vancouver Community and Richmond Public Health which use, as noted above, the primary access regional information system—PARIS). These systems have common diagnostic data definitions for each communicable disease, and data input is done by trained staff. Data on communicable diseases is collected by the health authorities in iPHIS and PARIS and sent to the B.C. Centre for Disease Control where the data is continually updated. This provides a picture of communicable disease outbreaks and of clusters of newly emerging and re-emerging diseases in each authority and across the province.

The iPHIS system may provide an information management framework for data collection and analysis for infection prevention, surveillance and control across the continuum of care.

The health authorities have identified data quality assurance as an issue

In 2004, the B.C. Centre for Disease Control undertook a survey of hospitals to identify trends in various national areas of infection concern, such as C. difficile. Only 57% of the hospitals solicited responded, and the quality and quantity of data varied with facility and health authority. The study concluded that infection control programs in British Columbia vary in their capacity to conduct surveillance for C. difficile illness and lack consistent case definitions, laboratory testing protocols and infection control practice guidelines.

We found that each health authority—and even programs and sites within a health authority—may collect its own information on infections, using various technologies, data definitions, and tracking and input methodologies. However, the health authorities are

aware of these differences and the impact this has on their ability to identify occurrences and rates of infection and to take appropriate action. For example, Vancouver Coastal and Fraser Health have both developed standardized collection tools and data collection methods for VRE, MRSA and CDAD.

Vancouver Coastal Health hired an epidemiologist as a member of its infection control team. This person is responsible for establishing and maintaining a regional surveillance system that addresses, among other things, data quality and consistency of reporting.

We expected to see regular reporting by the infection control program to the Health Authority Medical Advisory Committee (HAMAC), the executive, and the Board of Directors, and that these groups would discuss the reports and initiate action or follow-up as appropriate.

We also expected to see that reports were being distributed to programs and services internally across each authority and across all programs based on the HAMAC and health authority structures for quality improvement opportunities.

Conclusion

Reporting on the infection control program to the Health Authority Medical Advisory Committees, senior executive teams and Boards of Directors varies across the health authorities. However, in all authorities the reporting on infection prevention, surveillance and control is limited. As well, public reporting is limited.

Findings

Infection surveillance and audit reports are sometimes used to improve practice

Infection surveillance and audit reports are used in all the health authorities to some degree to make changes in their infection management practices. We found examples in all health authorities where changes were made to practice as a result of a review. However, we also noted that these reports sometimes resulted only in changes at one site or one Health Service Delivery Area rather than being shared across the health authority to assess the applicability of the findings and recommendations to other programs and areas. For example, in 2003–2004, the Nanaimo General Hospital measured the rate of C. difficile infections and found it to be increasing. In response, a practice review was undertaken, which determined that eight actions needed to be taken to address the situation. As these actions were implemented, the rate dropped dramatically. Tools for the ongoing management of C. difficile were also created.

The results of the review, the actions taken and the tools for ongoing management were not shared across the Vancouver Island Health Authority.

Reporting the status of infection prevention, surveillance and control

We also saw examples of external reports being used by the health authorities to review their own practices and to change as appropriate. For example, when Health Canada identified contamination of ultrasound gels at the manufacturing stage, Vancouver Coastal Health identified practices within its facilities that could lead to contamination of medical gels and ultrasound gels. Various Infection Control Committees throughout the authority used the information for discussion and action. We found another example in Fraser Health where, in response to an issue in Ontario related to the reprocessing of trans-rectal ultrasound prostate biopsy probes, the authority conducted a review of its reprocessing procedures. Fraser Health found that it was reprocessing this equipment correctly. However, the review raised questions about the reprocessing of other small patient care items. Further study resulted in changes to the processing practices for such items.

Reporting to the Board of Directors is minimal

The Board of Directors is ultimately accountable for the quality of medical care and provision of appropriate resources in the facilities and programs operated by the health authorities. Thus, the boards have a role to play in the oversight of the infection control program either directly or through their Quality Committees (these committees are named differently in each authority, but have similar terms of reference and are accountable to the board).

Each health authority board determines the type and frequency of information and reports that it wants to receive. We therefore found there was no consistency across the health authorities, with the exception that all boards receive regular reports on the status of the indicators in their Performance Agreements with the Ministry of Health that include: immunization rates for two-year-olds; flu immunization rates for residents of residential care facilities; and flu immunization rates for health care workers. In addition, the boards also receive the results of both the provincial housekeeping audits and their internal housekeeping audits.

In all the health authorities, we found that information about the infection control program and infection control issues are brought to the attention of the board, but that very few boards receive comprehensive reports on surveillance activities. Topics coming to the attention of the boards include: influenza pandemic planning, outbreaks (e.g., C. difficile and Norwalk virus), caesarean section

Reporting the status of infection prevention, surveillance and control

infection reports and policy approval. Those authorities making changes and adding resources to their programs (such as Vancouver Coastal Health and Interior Health) are providing regular updates to the board.

Two boards — those of the Provincial Health Services Authority and the Vancouver Island Health Authority — receive regular reports on hospital-acquired infections. The Provincial Health Services Authority's board, for example, receives quarterly reports from Children's and Women's. These include the rates (with limitations), benchmarks and comparators for nosocomial-acquired bloodstream infections for inpatients, nosocomial surgical site infections for inpatients, nosocomial surgical site infections for c-sections in the special care nursery, and MRSA and VRE colonization cases in the special care nursery. The Vancouver Island Health board receives a twice-yearly report on infections in the authority.

The boards are also supposed to receive regular reports from the Health Authority Medical Advisory Committee (HAMAC) on the quality, effectiveness and availability of medical care provided in relation to professional standards, in facilities and programs operated by the authorities. We found very limited reporting by HAMACs to the boards. This lack of reporting was highlighted by the Quality Committee of the Fraser Health board. It had requested a determination of why there had been no reporting by the HAMAC and to have the problem rectified before the Auditor General's audit.

Health Authority Medical Advisory Committees are providing only limited oversight of infection prevention, surveillance and control

All health authorities except for one have a health authority Medical Advisory Committee (HAMAC). The exception is the Provincial Health Services Authority (where each agency has its own Medical Advisory Committee). The membership of the HAMACs vary by health authority, but usually include medical staff appointed to medical leadership roles, medical staff elected by the medical staff, the Medical Health Officer, the Senior Medical Administrator of the health authority, the CEO as a non-voting member and other senior administration and medical staff as appropriate and as non-voting members.

Reporting the status of infection prevention, surveillance and control

The roles and responsibilities of the HAMACs are defined in their Medical Staff Bylaws and address: the provision of advice to the board and the CEO on the medical care provided within the facilities and programs operated by the authority; monitoring of the quality and effectiveness of medical care and the adequacy of resources; and the continuing education of the medical staff. The HAMACs are expected to receive and review reports from quality review bodies and committees concerning the evaluation of clinical practice.

Committees accountable to the HAMACs include: Pharmacy and Therapeutics Committees, Infection Control Committees, and Medical Advisory Committees (MACs) at a site or Health Service Delivery Area level. (The MACs may also have Pharmacy and Therapeutics and Infection Control Committees accountable and reporting to them.)

We found that although the HAMACs are responsible for receiving reports from Infection Control Committees, in fact they are being given very limited information on issues related to infection control.

Reporting to senior executive teams varies across the health authorities

There is no standardized reporting of infection control management to the senior executive teams. Rather, the information going to the executive teams is situation dependent. For example, the indicators in a Performance Agreement with the ministry are closely monitored and reported, as are the results of housekeeping audits (provincial and internal). Authorities in which the Chief Medical Health Officer is a member of the senior executive team they do receive regular updates on such topics as pandemic planning and outbreaks.

As well, authorities that are making (or thinking about making) changes to their infection control programs frequently take the matters to team meetings for discussion and decisions.

Infection surveillance reports are seldom received or discussed by the senior executive teams. However, minutes of a meeting of the Fraser Health executive team do note the receipt of C. difficile surveillance reports; and Vancouver Island Health executive team minutes note the receipt of surgical infection rates for South Island. In addition, as a result of the review at Surrey Memorial Hospital,

reports on caesarean-section infection rates are being reported to the senior executive teams.

Two health authorities issue an infection control program annual report

The Health Act and its regulations require the five geographic health authorities to report communicable diseases to Public Health and to the B.C. Centre for Disease Control, which receives the reports on behalf of the Provincial Health Officer (the centre then reports these diseases to the Public Health Agency of Canada). As well, the five geographic health authorities must, as part of their Performance Agreement with the Ministry of Health, report on three measures related to immunizations: the rate of up-to-date immunizations for two-year-olds, the rate of influenza immunization for residents of care facilities, and the influenza immunization rates for health care workers. The Provincial Health Services Authority is required to report only on the influenza immunization rates for health care workers, because its program responsibilities do not include Public Health or residential care services.

We found that all health authorities are meeting their reporting requirements.

There is no requirement for the health authorities to report on their nosocomial infection rates. However, both Vancouver Coastal Health and Vancouver Island Health issue annual reports on their infection control programs and those reports include infection rates.

Vancouver Coastal Health's annual report in 2004, included in addition to the region-wide report, reports by cluster or agency with the exception of Providence Health Care. These reports all include infection rates for specific organisms, surgical site infection rates (where monitored), outbreaks, education provided to staff and any special projects undertaken. Eight key performance indicators are identified and measured. However, we noted there is no information in any of the reports related to Public Health and communicable diseases in the community.

The annual reports and the results of the housekeeping audits are available on the health authority's website. Exhibit 7 highlights the eight key indicators that the authority measures.

Reporting the status of infection prevention, surveillance and control

Exhibit 7

Infection Control Key Performance Indicators, Vancouver Coastal Health Authority

Indicator 1: Selected antibiotic resistant organisms identified in inpatients and outpatients*

Indicator 2: The incidence of C. difficile associated diarrhea in inpatients*

Indicator 3: Selected inpatient surgical procedures complicated by surgical site infections as defined by NNIS (Centres for Disease Control, Atlanta) at VGH, UBCH, LGH

Indicator 4: Syndromic surveillance of respiratory diseases at VGH

Indicator 5: Hospital-acquired bacteremias at VGH

Indicator 6: Patients identified as having *M. Tuberculosis**

Indicator 7: Number of hours spent on infection control education/in-services

Indicator 8: Outbreaks of communicable diseases*

* data collected at all sites

Source: Vancouver Coastal Health Authority, A New Portfolio for Infection Control: Annual Report (2004)

Vancouver Island Health Authority's infection control program annual report focuses on both hospital-acquired infections and communicable diseases. The report reflects the authority as a whole, but the information provided is more robust for the South Island because it has had a more comprehensive infection control program than the Central Island and North Island. This report is not available on the health authority's website.

Although not a specific report about infection rates, an internal audit report of infection control by Interior Health has been made available on the authority's website, along with the updates that have been reported to the board and senior executive team. The health authority also publishes the results of the provincial housekeeping audit.

The B.C. Centre for Disease Control issues an annual report on reportable diseases

The Ministry of Health does not issue any reports on infection rates or communicable disease rates for the province. However, the B.C. Centre for Disease control issues an annual report—the *British Columbia Annual Summary of Reportable Diseases*—which is available on the website.

Response from the Ministry of Health

The Ministry of Health wishes to acknowledge the work of the team that has produced the Office of the Auditor General's (OAG) report on infection control, and to recognize the many dedicated professionals within British Columbia's health care system who provide, support and enable best practices in infection control.

The audit, completed in February 2006 captured a picture of the state of infection control within the B.C. health care system. As the authors of the OAG report acknowledge, several significant efforts to support infection control were, at the time they were examined, still in their initial stages. This response also includes a brief summary of these efforts since the report authors' data was collected.

The Ministry approaches infection control through a comprehensive system-wide framework that supports best practices, and sets appropriate expectations for health authorities for infection control, using policy guidelines, formal accountability documents and targeted funding. This differs from the hands-on, institution-based infection control practiced by facilities and practitioners. Ministry initiatives underway include:

1. Health authority performance agreements that include specific deliverables and measures relating to infection control and patient safety such as:
    - Implementation of the Provincial Infection Control Network's guidelines on *Clostridium difficile* and seasonal respiratory disease; and
    - Implementation of the recommended healthcare associated infection surveillance system.
2. Provincial Infection Control Network: *The Provincial Infection Control Network ("PICNet") was created by the Ministry of Health in January 2005, prior to the start of the audit. PICNet receives annualized funding to support and promote best practices in infection control.*

    PICNet's mission is to maximize coordination and integration of activities related to health care associated infection prevention, surveillance and control for the entire province using an evidence-based approach. PICNet plays a crucial role in establishing best practices, standardized definitions and surveillance methodologies to ensure consistent high quality data on a province-wide basis.

The Provincial Infection Control Network consists of the entire "community of practice" involved in infection prevention, surveillance and control of healthcare associated infections; members represent the full continuum of care, and all B.C. health authorities. This partnership links organizations responsible for infection control and is a good example of the strength of cooperation across health authorities.

3. Patient Safety Task Force: *The Patient Safety Task Force (PSTF) was established to bring together clinical leaders to work towards improving patient safety in areas including drug reactions, hospital-acquired infections, standardized sterilization procedures, surgery and anaesthesia.*

4. Promoting research and education: *British Columbia remains the only province to create a Chair in Patient Safety. To be based at the University of British Columbia, this new position will be filled as soon as the selection process currently underway is completed.*

5. Broadcast system for warnings and recalls on marketed health products: *A broadcast system is being developed as a component of the BC Patient Safety Learning System, in development by the PSTF. The broadcast system will provide notification to health authorities of warnings, recalls and advisories which could affect patient safety or infection control, disseminate this information throughout the health authorities and track required follow-up actions by health authority staff.*

6. Ministry of Health Executive Director, Clinical Innovation and Integration: *One of the mandates of this division within the Ministry is to further develop a patient safety framework and facilitate relationships between the various patient safety and quality of care groups within the Ministry and with outside partners such as health authorities. A well experienced former primary care physician has been appointed to lead this work.*

7. Occupational Health and Safety Agency for Healthcare: *The Agency has completed and is leading a number of initiatives to protect healthcare workers from infectious diseases.*

8. Revision of the Health Act: *A project to thoroughly revise the Health Act, underway prior to the audit, will update the legislative framework for monitoring, reporting on and responding to communicable diseases, modernize powers regarding quarantine, isolation, testing, examination, and contact follow up, and include a clearer role definition for practitioners dealing with infectious diseases.*

9. Development of Best Practices: *In addition to the best practices being developed by PICNet, best practices have also been developed by other agencies:*

   - B.C. Center for Disease Control produced a generic infection control manual for residential care in 1997 and updated it in 2003.
   - Guidelines for Construction: There is widespread agreement across the health authorities that the designs of any renovation or new facility construction should mitigate the risks of spreading infection.

10. Surveillance, Compliance and Auditing: *British Columbia has been one of the leading partners with Canada Health Infoway in the creation of health information systems under the umbrella of the e-health strategy. E-Health can be defined as an integrated set of technologies, provision of accurate and timely information, and related process enhancements that together enable the efficient delivery of health care services, and incorporate the Electronic Health Record (EHR) and Telehealth. Some components of the Province's e-health strategy include:*

    a. Development of Panorama: *This is a major initiative that pre-dates the audit, to significantly improve communicable disease surveillance, and eventually replace the integrated Public Health Information System mentioned in the report.*

       This is a partnership of a federally funded project to create a pan-Canadian communicable disease surveillance and management system (called Panorama) and the BC Public Health Information Project. This system will provide real time communicable disease surveillance capability, outbreak management and alerting functions, allow privacy-protected cross-agency sharing of information, standardized reporting capability, and will meet modern information system standards.

       The ministry is exploring the feasibility of adding integrated healthcare associated infection surveillance across the continuum of care with PICNet and the Health Authorities. Evaluation will be started to assess if the current communicable disease management modules can be adapted to include hospital associated infections.

b. Development of BC Patient Safety Learning System: *The Ministry of Health is funding and supporting, through the Patient Safety Task Force, development of a web-based system to support identification, investigation, and analysis of safety and risk-related incidents and near-misses, capture and facilitate response to client feedback, and allow claims management. This system is currently in the pilot phase.*

c. The British Columbia Reproductive Care Program: *The British Columbia Reproductive Care Program (BCRCP) has a number of projects directly involved with patient safety and infection control. Currently, data is collected retrospectively on every birth in the province. The Ministry provides $500,000 in annual funding for the BCRCP to build upon the existing perinatal form and database to capture information on postpartum complications, including infections, haemorrhages, and readmission of mothers and/or infants to hospital.*

11. Human Resources: *There is a need to estimate the overall requirements for personnel involved in infection prevention and control programs within the health authorities. It will include the multi-disciplinary team of infection control practitioners, communicable disease nurses, occupational health nurses, occupational health physicians, medical microbiologists, infectious disease physicians, epidemiologists, laboratory technicians, and support staff. Health authorities are examining their staffing levels and patterns and identifying where changes are required.*

    The field of infection control as a specialty continues to evolve. PICNet is beginning to identify appropriate competencies and resources for Infection Control Practitioners. In addition, the Ministry and health authorities recognize that there is room for improvement in medical support and will be working together to address this issue, with consideration being given to physicians balancing current clinical workloads with infection control responsibilities.

12. Continuing Education: *The Ministry, through PICNet, is currently supporting several types of education for infection control practitioners:*

    1. *Sponsoring Webber Training Courses (facilitated teleclasses relating to infection control and prevention) and other lecture series;*

    2. *Providing education and professional support through its educational conferences;*

3. *Sponsoring selected working group members to attend educational conferences; and*

4. *Developing a healthcare associated infections surveillance training manual and on-line infection control modules about the prevention of surgical site infections and prevention of central venous catheter infections.*

13. Reporting to health authority boards, senior management, and public: *The Ministry of Health will ask the Patient Safety Task Force to review and make recommendations about the communication of infection control and patient safety information to Medical Advisory Committees, health authority administration and their Boards.*

We again wish to express our appreciation for the dedication of resources by the Office of the Auditor General to a health care issue that we all consider to be a high priority.

The Ministry recognizes the limitation of a "snap shot" in time provided by these audits, and appreciates the opportunity to provide additional details of significant initiatives such as the development of the Provincial Infection Control Network.

The Ministry of Health, the Health Authorities, professionals and support staff are all committed to achieving the highest levels of patient safety and quality of care for British Columbians.

Appendices

Appendix A: System Failure versus Personal Accountability—The Case for Clean Hands[1]

Donald Goldmann, M.D.

A new mother sits by her tiny, premature infant in a neonatal intensive care unit. She watches as a physician touches the baby without first washing his hands or using the waterless, alcohol hand antiseptic just a couple of feet away. A few minutes later, a nurse and then another doctor also fail to perform these basic procedures. When her baby was admitted to the unit, the mother was told to remind caregivers to wash their hands, but only after witnessing repeated failures does she muster the courage to speak up about the practice she thought would be routine. By then, her baby has acquired methicillin-resistant Staphylococcus aureus (MRSA) —probably transported on the hands of a care giver who had been examining other babies who are colonized with MRSA. A few days later MRSA invades the baby's bloodstream; it eventually proves fatal. Such preventable infections, caused by the failure to practice hand hygiene, are far from rare, and they occur in many of the finest neonatal intensive care units in the United States.

MRSA and other health care associated infections have been prime targets of hospital infection control and patient safety programs for years, yet the prevalence of antibiotic-resistant bacteria continues to increase, and the rate of infections caused by these pathogens remains unacceptable. What can be done about these seemingly intractable problems?

Patient-safety experts stress that complex error-prone systems are at the root of most mistakes in health care. Archaic, poorly designed systems often undermine the best efforts of well-intentioned, highly motivated clinicians and health care personnel to provide safe care. A major goal of contemporary patient-safety programs is to encourage a culture of safety and create a blame-free environment in which errors are seen as a by-product of bad systems, not as caused by bad or incompetent people. This orientation toward improving

[1] Dr. Donald Goldmann. 2006. "System Failure versus Personal Accountability—The Case for Clean Hands." *New England Journal of Medicine*, July 13, 2006. (Used with permission.)

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systems rather than blaming people who make mistakes is critical, since it encourages caregivers to report adverse events and near misses that might be preventable in the future. Improvement is impossible without such reports, which permit hospitals to gain an understanding of the factors that lead to mistakes and create systems that support safer practices. Although reports tend to focus on major, dangerous errors that occur relatively infrequently, lower profile mistakes that many caregivers make virtually everyday, such as not washing their hands, also need to be documented and understood if the systems are to be improved.

But if we really are serious about making care safer, I would argue that we need to find the right balance between blaming mistakes on systems and holding individual providers accountable for their everyday practices.

Curbing the alarming increase in the rate of antibiotic-resistant infections surely requires both systemic improvements and increased personal accountability.

Infections with antibiotic-resistant bacteria such as MRSA, which are difficult to treat, are transmitted primarily by the contaminated hands of health care providers who have touched a colonized patient or something in the patient's environment. Patients who are colonized or infected with resistant pathogens often have billions of colony-forming units of bacteria per millimetre of sputum or per gram of stool. Their skin and immediate environment may also be heavily contaminated. Caregivers who leave the bedsides of such patients without performing hand hygiene may carry thousands or even hundreds of thousands of colony-forming units of antibiotic-resistant bacteria on their hands. Even if the caregivers wear gloves while caring for patients who they know are colonized with resistant bacteria, they frequently contaminate their hands when they remove their gloves.

Fortunately, the remedy for this situation is simple. If every caregiver would reliably practice simple hand hygiene when leaving the bedside of every patient and before touching the next patient, there would be an immediate and profound reduction in the spread of resistant bacteria. The recent widespread deployment of waterless, alcohol-based hand antiseptics has made this task easier

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even for harried caregivers. Performing hand hygiene with these products kills bacteria (with the exception of clostridium difficile) very rapidly, takes much less time than traditional hand washing, and is gentler on the hands than the repeated use of soap and water. Yet compliance with hand hygiene remains poor in most institutions —often in the range of 40 to 50 percent.[2,3]

The system is partly to blame. First, staff members must not be so seriously overworked that they do not have time to perform important standard procedures. Second, many hospitals do not have programs to ensure that caregivers are adequately educated —that they know exactly how much alcohol to apply, how long to rub their hands together, and which skin surfaces are most important to cover. Once educated, caregivers should also have their hand-hygiene competency assessed and certified. And then they must have reliable access to alcohol-based antiseptics at the point of care, which requires a foolproof system for refilling dispensers before they run dry. Dispensers must be functional and must reliably deliver the appropriate amount of alcohol. Although the alcohol-based rubs in current use are gentle on the hands, lotions should also be easily accessible, in case of irritation. Clearly, the resolution of such system issues is not terribly complicated; in the realm of hand hygiene, near perfect reliability should be achievable.[4,5,6]

Imagine, then, a hospital that has perfected its hand-hygiene system and monitors it regularly to detect failures. If a caregiver in such an institution neglects to perform hand hygiene when leaving the bedside in any case except a life-threatening emergency, it is no longer logical to blame the system. Experts in human error have a word for the failure to follow clear rules in the face of

[2] Pittet D, Mourouga P, Perneger TV. Compliance with handwashing in a teaching hospital. Ann Intern Med 1999; 130:126-30.

[3] Lanford MG, Zemblower TR, Trick WE, Hacek DM, Noskin GA, Peterson LR. Influence of role models and hospital design on hand hygiene of healthcare workers. Emerg Infect Dis 2003; 9:217-23.

[4] How-to-guide: improving hand hygiene. Cambridge, Mass.: Institute for Healthcare Improvement, March 2006. (Accessed June 22, 2006, http://www.ihi.org/IHI/Topics/CriticalCare/IntensiveCare/Tools/HowtoGuideImprovingHandHygiene.htm.)

[5] Guideline for hand hygiene in health-care settings: recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. MMWR Recomm Rep 2002; 51(RR-16):1-45.

[6] WHO guidelines on hand hygiene in health care (advanced draft): a summary. Geneva: World Health Organization, 2005. (Accessed June 22, 2006, at http://www.who.int/patientsafety/events/05/HH_en.pdf.)

well-functioning systems: "violation." Repeated violations in health care, as in any industry, should have consequences.

Another industry in which cleanliness is paramount — computer-chip manufacturing — may be able to teach us something about this issue. When a worker enters a "clean room" where computer chips are being made, he or she must don a special suit, gloves, and mask to prevent the chips from becoming contaminated. These required materials are always available, and the clean-room system is highly reliable. A single failure to follow the rules results in a warning. Employees who violate the rules twice risk disciplinary action — for, after all, millions of dollars are at stake if contamination occurs. The performance expectations, in my view, should be at least as high when the stakes are lives rather than profits.

When a doctor or a nurse can reduce the spread of antibiotic-resistant bacteria by practising simple hand hygiene, accountability should matter. True, the hospital and its leaders are accountable for establishing a system in which caregivers have the knowledge, competence, time, and tools to practice perfect hygiene. But each caregiver has the duty to perform hand hygiene — perfectly and every time. When this widely accepted, straightforward standard of care is violated, we can not continue to blame the system.

Dr. Goldmann reports having received research-grant support from Clorox and having served as a consultant to the Cosmetic Toiletry and Fragrance Association and to Warner-Lambert.

Dr. Goldmann is senior vice president of the Institute for Healthcare Improvement, Cambridge, Mass., and a professor in the Department of Pediatrics at Harvard Medical School, Boston.

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Appendix B: List of reportable communicable diseases in British Columbia

Reportable Communicable Diseases (reportable by all sources)		List of Communicable Diseases (reportable by laboratories only)
Acquired Immune Deficiency Syndrome	Leprosy	All specific Bacterial and Viral Stool Pathogens: (i) Bacterial: Campylobacter; Salmonella; Shigella; Yersinia. (ii) Viral
Anthrax	Lyme Disease	Amoebiasis
Botulism	Measles	Borrelia Burgdorferi Infection
Brucellosis	Meningitis all causes: (i) Bacterial: Hemophilus; Pneumococcal; other (ii) Viral	Cerebrospinal Fluid Micro-organisms
Cholera	Meningoccocal Disease: All Invasive; including Primary Meningococcal Pneumonia and Primary Meningococcal	Chlamydial Diseases including Psittacosis
Congenital infections: Toxoplasmosis, Rubella, Cytomegalovirus, Herpes Simplex, Varicella-zoster, Hepatitis B Virus, Listeriosis, and any other Congenital Infection	Conjunctivitis	Cryptococcus neoformans
Cryptosporidiosis	Mumps	Herpes Genitalis
Cyclospora Infection	Neonatal Group B Streptococcus Infection	Human Immunodeficiency Virus
Diffuse Lamellar Keratitis (DLK)	Paralytic Shellfish Poisoning (PSP)	Influenza
Diphtheria: cases, carriers	Pertussis (Whooping Cough)	Legionellosis
Encephalitis: Post-infectious, Subacute Sclerosing Panencephalitis, Vaccine-related, Viral.	Plague	Leptospirosis
Food-borne illness: All Causes	Poliomyelitis	Listeriosis
Gastroenteritis epidemic: Bacterial, Parasitic, Viral	Rabies Reye's Syndrome	Malaria
Genital Chlamydia Infection	Rubella: Congenital Rubella Syndrome	Q fever
Giardiasis	Severe Acute Respiratory Syndrome	Rickettsial Diseases
Haemophilus Influenza Disease, All Invasive by Type	Smallpox	Severe Acute Respiratory Syndrome
Hantavirus Pulmonary Syndrome	Tetanus	Smallpox
Hemolytic Uremic Syndrome	Transfusion Transmitted Infection	Tularemia
Hemorrhagic Viral fevers	Tuberculosis	West Nile Virus Infection
Hemorrhagic Viral fevers	Tularemia	
Hepatitis Viral: Hepatitis A; Hepatitis B; Hepatitis C; Hepatitis E; other Viral Hepatitis	Typhoid Fever and Paratyphoid Fever	
Human Immunodeficiency Virus	Venereal Disease: Chancroid; Gonorrhea – all sites; Syphilis	
Invasive Group A Streptococcal Disease	Waterborne Illness: All causes	
Invasive Streptococcus Pneumoniae Infection	West Nile Virus Infection	
	Yellow Fever	

Source: Health Act Communicable Disease Regulation (BC Reg. 281/2004)

Appendix C: Canadian Standards Association infection control during construction or renovation of health care facilities (April 2003)

The standard describes precautionary and remedial measures for preventing exposure to agents, released or augmented, because of actions undertaken during health care facility construction, renovation, maintenance, and repair work.

Preventive measures are categorized as I, II, III and IV and are put in place for all stages of construction activity—before, during, and after. The prevention measures required are based on the analysis of population risk group and type of construction activity. Table 1 shows a preventive measures analysis and includes the use of information from Tables 2 and 3.

Table 1: Preventive Measures Analysis

Population Risk Group[1]	Construction activity type[2]			
	Type A	Type B	Type C	Type D
Group 1	I	II	II	III/IV
Group 2	I	II	III	IV
Group 3	I	III	III/IV	IV
Group 4	I - III*	III/IV	III/IV	IV

[1] See Table 2 to determine population risk group

[2] See Table 3 to determine construction activity

* When the risk group is Group 4 and construction activity is Type A, the infection prevention and control department shall be consulted to determine the appropriate preventive measure (I, II, or III).

Table 2: Population Risk Groups and Geographical Areas (Examples only)

Population Risk Group	Typical areas
Group 1 Lowest Risk	Office areas Public areas Physical plant workshops and housekeeping areas
Group 2 Medium Risk	Outpatient clinics (except oncology and surgery) Admission and discharge units Physical therapy areas remote from patient care areas

Appendix C

Population Risk Group	Typical areas
Group 3 Medium to high risk	Emergency (except trauma rooms) Nurseries for healthy newborns Geriatrics Nuclear medicine
Group 4 Highest risk	Intensive care units Oncology units and outpatient clinics for cancer patients Burn care units Trauma rooms Operating rooms Sterile supply areas

Table 3: Construction Activity Type (Examples only)

Construction Activity Type	Description
Type A	Inspection and non-invasive activities. These include but are not limited to: a) activities that require removal of no more than one ceiling tile or require wall or ceiling panels to be opened; and b) electrical trim work.
Type B	Small scale, short duration activities that create minimal dust. These include, but are not limited to: a) activities that require access to chase spaces; and b) plumbing work that disrupts the water supply of more than one patient care area (i.e., two or more rooms) for less than 30 minutes.
Type C	Activities that generate a moderate to high level of dust; require demolition; require removal of a fixed building component (e.g., sink) or assembly (e.g., countertop, cupboard); or cannot be completed in a single work shift. These include but are not limited to, a) activities that require sanding of a wall in preparation for painting or wall covering; b) removal of floor coverings, ceiling tiles, a d casework; c) electrical work above ceilings.
Type D	Activities that generate high levels of dust and major demolition and construction activities requiring consecutive work shifts to complete. These include but are not limited to: a) activities that involve heavy demolition or removal of complete cabling systems; and b) plumbing work that disrupts the water supply of more than one patient care area (i.e., two or more rooms) for more than 1 hour.

Appendix D: Office of the Auditor General: Performance Auditing Objectives and Methodology

The Office has three lines of business:

- examining the reliability of the provincial public sector's financial reporting;
- assessing how well the public sector manages its key risks; and
- assessing the quality of provincial public sector performance reports.

Each of these lines of business have certain objectives that are expected to be achieved, and each employs a particular methodology to reach those objectives. The following is a brief outline of the objectives and methodology applied by the Office for assessing how well the public sector manages its key risks.

Performance Auditing

What are Performance Audits?

Performance audits (also known as value-for-money audits) examine whether money is being spent wisely by government —whether value is received for the money spent. Specifically, they look at the organizational and program elements of government performance, whether government is achieving something that needs doing at a reasonable cost, and consider whether government managers are:

- making the best use of public funds; and
- adequately accounting for the prudent and effective management of the resources entrusted to them.

The aim of these audits is to provide the Legislature with independent assessments about whether government programs are implemented and administered economically, efficiently and effectively, and whether Members of the Legislative Assembly and the public are being provided with fair, reliable accountability information with respect to organizational and program performance.

Appendix D

In completing these audits, we collect and analyze information about how resources are managed; that is, how they are acquired and how they are used. We also assess whether legislators and the public have been given an adequate explanation of what has been accomplished with the resources provided to government managers.

Focus of Our Work

A performance audit has been described as:

... the independent, objective assessment of the fairness of management's representations on organizational and program performance, or the assessment of management performance, against criteria, reported to a governing body or others with similar responsibilities.

This definition recognizes that there are two forms of reporting used in performance auditing. The first—referred to as attestation reporting—is the provision of audit opinions as to the fairness of management's publicly reported accountability information on matters of economy, efficiency and effectiveness. This approach has been used to a very limited degree in British Columbia because the organizations we audit do not yet provide comprehensive accountability reports on their organizational and program performance.

We believe that government reporting along with independent audit is the best way of meeting accountability responsibilities. Consequently, we have been encouraging the use of this model in the British Columbia public sector, and will apply it where comprehensive accountability information on performance is made available by management.

As the performance audits conducted in British Columbia use the second form of reporting—direct reporting—the description that follows explains that model.

Our "direct reporting" performance audits are not designed to question whether government policies are appropriate and effective (that is achieve their intended outcomes). Rather, as directed by the Auditor General Act, these audits assess whether the programs implemented to achieve government policies are being administered economically and efficiently. They also evaluate whether Members of the Legislative Assembly and the public are being provided

with appropriate accountability information about government programs.

When undertaking performance audits, we look for information about results to determine whether government organizations and programs actually provide value for money. If they do not, or if we are unable to assess results directly, we then examine management's processes to determine what problems exist or whether the processes are capable of ensuring that value is received for money spent.

Selecting Audits

All of government, including Crown corporations and other government organizations, are included in the universe we consider when selecting audits. We also may undertake reviews of provincial participation in organizations outside of government if they carry on significant government programs and receive substantial provincial funding.

When selecting the audit subjects we will examine, we base our decision on the significance and interest of an area or topic to our primary clients, the Members of the Legislative Assembly and the public. We consider both the significance and risk in our evaluation. We aim to provide fair, independent assessments of the quality of government administration and to identify opportunities to improve the performance of government. Therefore, we do not focus exclusively on areas of high risk or known problems.

We select for audit either programs or functions administered by a specific ministry or government organization, or cross-government programs or functions that apply to many government entities. A large number of such programs and functions exist throughout government. We examine the larger and more significant of these on a cyclical basis.

Our view is that, in the absence of comprehensive accountability information being made available by government, performance audits using the direct reporting approach should be undertaken on a five- to six- year cycle so that Members of the Legislative Assembly and the public receive assessments of all significant government operations over a reasonable time period. We strive to achieve this schedule, but it is affected by the availability of time and resources.

Appendix D

Planning and Conducting Audits

A performance audit comprises four phases—preliminary study, planning, conducting and reporting. The core values of the Office—independence, due care and public trust—are inherent in all aspects of the audit work.

Preliminary Study

Before an audit starts, we undertake a preliminary study to identify issues and gather sufficient information to decide whether an audit is warranted.

At this time, we also determine the audit team. The audit team must be made up of individuals who have the knowledge and competence necessary to carry out the particular audit. In most cases, we use our own professionals, who have training and experience in a variety of fields. As well, we often supplement the knowledge and competence of our staff by engaging one or more consultants to be part of the audit team.

In examining a particular aspect of an organization to audit, auditors can look either at results, to assess whether value for money is actually achieved, or at management's processes, to determine whether those processes should ensure that value is received for money spent. Neither approach alone can answer all the questions of legislators and the public, particularly if problems are found during the audit. We therefore try to combine both approaches wherever we can. However, because acceptable results-oriented information and criteria are often not available, our performance audits frequently concentrate on management's processes for achieving value for money.

If a preliminary study does not lead to an audit, the results of the study may still be reported to the Legislature.

Planning

In the planning phase, the key tasks are to develop audit criteria—"standards of performance"—and an audit plan outlining how the audit team will obtain the information necessary to assess the organization's performance against the criteria. In establishing the criteria, we do not expect theoretical perfection from public sector managers; rather, we reflect what we believe to be the reasonable expectations of legislators and the public.

Appendix D

Conducting

The conducting phase of the audit involves gathering, analyzing and synthesizing information to assess the organization's performance against the audit criteria. We use a variety of techniques to obtain such information, including surveys, and questionnaires, interviews and document reviews.

Reporting Audits

We discuss the draft report with the organization's representatives and consider their comments before the report is formally issued to the Legislative Assembly. In writing the audit report, we ensure that recommendations are significant, practical and specific, but not so specific as to infringe on management's responsibility for managing. The final report is tabled in the Legislative Assembly and referred to the Public Accounts Committee, where it serves as a basis for the Committee's deliberations.

Reports on performance audits are published throughout the year as they are completed, and tabled in the Legislature at the earliest opportunity. We report our audit findings in two parts: an Auditor General's Comments section and a more detailed report. The overall conclusion constitutes the Auditor General's independent assessment of how well the organization has met performance expectations. The more detailed report provides background information and a description of what we found. When appropriate, we also make recommendations as to how the issues identified may be remedied.

It takes time to implement the recommendations that arise from performance audits. Consequently, when management first responds to an audit report, it is often only able to indicate its intention to resolve the matters raised, rather than to describe exactly what it plans to do.

Without further information, however, legislators and the public would not be aware of the nature, extent, and results of management's remedial actions. Therefore, we publish updates of management's responses to the performance audits. In addition, when it is useful to do so, we will conduct follow-up audits. The results of these are also reported to the Legislature.

Appendix E: Office of the Auditor General: 2006/07 Reports Issued to Date

Report 1 – April 2006

Strengthening Public Accountability: A Journey on a Road that Never Ends

Report 2 – September 2006

The 2010 Olympic and Paralympic Winter Games: Review of Estimates Related to the Province's Commitments

Report 3 – November 2006

Audit of Treaty Negotiations in British Columbia: An Assessment of the Effectiveness of British Columbia's Management and Administrative Processes

Report 4 – December 2006

Province of British Columbia Audit Committees: Doing the Right Things

Report 5 – December 2006

Audit of Government's Corporate Accounting System: Part 2

Report 6 – December 2006

Monitoring Government's Finance Province of British Columbia

Report 7 – December 2006

Government's Post-secondary Expansion — 25,000 Seats by 2010

Report 8 – December 2006

Changing Course — A New Direction for British Columbia's Coastal Ferry System: A Review of the Transformation of BC Ferries

Appendix E

Report 9 - January 2007

Seeking Best Practices in Financial Reporting: Report on the Province's 2005/06 Public Accounts

Report 10 - February 2007

Follow-up of 2004/2005 Report 2: In Sickness and in Health: Healthy Workplaces for British Columbia's Health Care Workers

Report 11 - March 2007

Infection Control: Essential for a Healthy British Columbia
The Provincial Overview

This report and others are available on our website at:
http://www.bcauditor.com